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Proceedings of TAKE 2019 - Theory and Applications in the Knowledge Economy Conference

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Many thanks to the reviewers who helped to ensure the quality of the full papers.

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Forewords

Ten years is a long time. In 2009 a bunch of friends gathered in Portugal for a conference that was to precede TAKE. In 2011 we repeated. Then, after a strange sequence of events, we finally organized TAKE for the first time in 2015 in Aveiro, followed by Zagreb, Poznan and now Vienna.

Florian Kragulj was in the first TAKE in Aveiro and from the start showed the highest level of enthusiasm and professionalism in the event. These characteristics were kept alive during all the 15 or so months during which we organized TAKE 2019.

That this edition of TAKE involves several entities linked with academia, i.e. WU Vienna University of Economics and Business, the Austrian Economic Chamber and the Institute for Applied Research on Skilled Crafts and Trades (IAGF). This in itself a big success and a sign of the Conference improvement. Also, we may see, by analysing the papers and in particular the streams, that TAKE has been following the economic times, and this year we have several papers on the Gig Economy. Only good conferences adjust, the others get stuck in time.

And success in Conferences is about teams. And in TAKE that team, is indeed, a very large group of people including the co-chairs, the local organizing team, the material organizers (Book of Abstracts and Proceedings), the stream leaders, and the paper reviewers – without all these persons nothing could have been done. And finally we had to depend on the authors, and their willingness to work with us. Without the work of these large dozens of devoted and skilled people TAKE 2019 would not have existed.

May I also mention that this time and with Florian's impulse and skill the organization of TAKE was improved in technological terms – in short we became techno – we used a website to deliver the mail list, a website to receive the scientific material and another website to receive the fees. All these were investments that eventually paid of, and that will guarantee a more stable organization for TAKE in the future. And we owe it to Florian. However, as the Human Resource Development part of TAKE (and more than anyone Gary Mc Lean) would remind us – “We are humans, Eduardo”, and technology helps, but in the end, is attention to detail, capacity to deal with the bizarre and to accommodate the weirdness making sometimes the impossible possible that differentiates a good conference, made doing things right, from an excellent conference, based in doing the right things. And on this last matter, believe me, we in TAKE are among the best in the world, because apart from being outstanding scholars, and good colleagues, we are an amazing group of friends, and friendship is the best way to turn good conferences into outstanding ones.

Many thanks, from the heart and enjoy the Conference.

Eduardo Tomé

Conference Chair, Universidad Europea

Lisbon, July 2019

For several reasons, this year's TAKE Conference was special. It was not only the largest TAKE Conference in terms of submissions and participants, but it clearly delivered on its mission to investigate the knowledge economy, both from a scientific as well as practitioners' perspective. The exceptional collaboration of strong partners from academia and business allowed for bringing together a Viennese mélange of the international scientific community engaging in knowledge-based management and related fields of research as well as entrepreneurs and industry partners that are represented by Austria's largest trade association.

This edition of the TAKE Conference paid particular attention to small and medium-sized enterprises. These companies do not only play a crucial role in today's economy – more than 95 % of all enterprises worldwide are small or medium-sized – but they also face specific knowledge related challenges. As a consequence, the research interest in them is constantly rising. This particularly holds true for enterprises that engage in skilled crafts and trades, as they even more rely on tacit and non-codified knowledge which is mainly passed on in informal ways.

By organizing TAKE 2019, we intended to establish a lasting environment for the scientific discourse on small and medium-sized enterprises and their dealing with knowledge and learning, and particularly focus on the value of (traditional) craftsmanship in the knowledge economy of today and tomorrow.

We hope you had an enjoyable time in Vienna.

Florian Kragulj

Conference Co-Chair, WU Vienna University of Economics and Business

Vienna, July 2019

The Austrian Economic Chamber's Crafts and Trades Division and the Institute for Applied Research on Skilled Crafts and Trades (IAGF) are very pleased to host this year's TAKE Conference in Vienna.

The objective of the TAKE Conference to bring together research and practice corresponds well with the founding principle of the Institute for Applied Research on Skilled Crafts and Trades (IAGF) to build bridges between the traditional craftsmanship and science.

The sciences and the economy, and particularly the economic sector of crafts and trades can learn a lot from each other. To this end, the TAKE Conference is a unique forum to discuss and shape the future of the knowledge economy, while paying particular attention to the development of traditional skilled professions and craftsmanship.

Reinhard Kainz

Managing Director of the Austrian Economic Chamber's Crafts and Trades Division

Paulus Stuller

President of the Institute for Applied Research on Skilled Crafts and Trades (IAGF)

Vienna, July 2019

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* These papers were considered by the Editors to have big interest for practitioners.

Accounting Systems and Auditing

Effects of Financial Management and Control System Implementation on Budgets of Counties in Croatia

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Abstract: Development of financial management and control system in the public sector has positive effect on the reduction of irregularities in the public administration and contributes to detection of different manipulations with public funds. Furthermore, it reduces the corruption risk and ensures preconditions for effective public fund management. Financial management and control system is established and developed to ensure efficient financial management in public sector. This system is designed to control business performance in a manner to support the realization of goals ensuring that funds are spent on economical, efficient and effective way. The key purpose of this system is to ensure the financial statements' reliability and comprehensiveness and to protect public funds from losses caused by inadequate management and unjustified spending. The Republic of Croatia has developed this system on the request of the European Union. EU required from all member states to develop an appropriate system that would be in charge of (1) monitoring the operation and management of public sector units as well as (2) informing society on spending public funds. The aim of the paper is to investigate the effects of financial management system and control implementation on the budgets of counties in Croatia, precisely to research to what extent the implementation of this system influenced the counties' budgets. Empirical research is based on secondary data collected from the consolidated annual reports on the system of internal controls in the public sector of Croatia over a period of ten years. The data collected will be analyzed using the correlation and regression analysis method. The paper presents the correlation between the development of the financial management and control system and the selected financial indicators calculated on the basis of information collected from budgets of counties in Croatia for ten years' period. The method of correlation analysis will be used to determine the degree of correlation between the two observed variables (selected factors of the financial management and control system and indicators from counties' budgets). This method explains the causal relationship between the observed indicators; in paper will be estimated the value of the dependent variable; and an appropriate regression model that describes the relationship between the observed variables will be developed. The representatively of the obtained regression model will be verified by the coefficient of determination and the coefficient of regression variation.

Key words: financial management, internal control, budget, efficiency, Croatia

1 Introduction

Efficient and effective public spending, especially in terms of transparency, has always been the overall objective of public institutions. The way in which public entities will achieve their objectives and missions depends on how they will be able to manage and control their own income and expenditure budget, regardless of the financing source (Popa & Nasta, 2016). In a business enterprise, effective management of finances aids the achievement of business objectives. Similarly, sound public financial management is critical to the achievement of the aims of the public sector through its role in improving the quality of public service outcomes; operational and strategic decision-making; long term sustainability of public services; building public trust in the performance of the sector; and ensuring the efficient and effective use of public funds (Parry, 2010).

Public Internal Financial Control (PifC) is a concept developed by the European Commission to support member states in the reform of their public internal control systems. The concept has had a major and important benefit in introducing, or creating the possibility to introduce, much higher standards of public expenditure control with a greater emphasis on value for money than the traditional arrangements that existed in pre-accession countries (Koning, 2007, p.2). PIFC represents the comprehensive system of financial and other controls established by the head of the budget user with the aim of successfully managing and achieving the task of the budget user. Internal financial control in the public sector includes all instruments established to control public revenues, expenditures, assets and liabilities. It includes all internal control systems and procedures in public institutions. Moreover it helps to ensure that public funds are appropriately spent and that the value invested is achieved (Ministry of Finance of the Republic of Croatia, 2007).

A professional, responsible, transparent and efficient public administration that serves the best interests of citizens can be the driver of a continuous and sustainable socio-economic development. Efficient system of financial management, control and internal audit improves transparency, financial discipline and adequate use of public money. Public finances would become more transparent and accountable, which would have a significant impact on the ability of institutions to fulfill their goals as well as the manager's responsibility for achieving institutions' goals. The objective of PIFC is to ensure compliance with laws and regulations, transparent, cost-effective, efficient and effective management of public funds (state funds and EU funds), to ensure control over the public funds and to measure achieved results.

2 Theoretical background

2. Key concepts of the public financial control

The term PIFC (Public Internal Financial Control) implies a complete, unified system established by governments to control, audit and report on spending public and EU funds. The internal financial control system of the public sector consists of the following basic elements (Audit Institution, 2015):

1. Financial management and internal control,
2. Functionally independent internal audit and

3. Central unit for financial management and control systems' harmonization and coordination and for internal audit methodology.

Financial management and control is PIFCs' first pillar. Financial management and control is a comprehensive system of policies, procedures and activities established by head of institution. The financial management and control system is system based on risk management. This system provides a reasonable assurance that the objectives of the institution will be achieved in a proper, economical, efficient and effective way. Internal controls are procedures conducted by executives and employees of the organization designed to provide reasonable assurance that institutions' goals will be achieved. Efficient internal control systems should be designed to provide a reasonable assurance to management that funds are spent in a lawful manner in accordance with regulations and policies, and that they are protected against wastage, loss and abuse. The internal control standards define the relevant requirements for effective financial management and control. In accordance with the COSO framework, internal control standards are based on five interconnected components/principles of internal control (Tušek et al., 2014):

- Control environment,
- Risk management,
- Control activities,
- Information and communication,
- Monitoring.

These five principles of internal control are also known as the COSO integrated risk management framework for enterprises/corporations. COSO, as a model of good governance, was established in the mid-1980s as a preventive mechanism for financial fraud in corporations and is equally used in both the private and public sectors.

Financial management and control refers to all financial and non-financial aspects of the institution's business, it is implemented in all organizational units and includes all resources, including foreign funds. The assumptions for establishing an efficient financial management and control system are clearly defined mission and objectives of the institution, appropriate organizational structure with established managerial responsibilities for objectives, budgetary funds and internal controls.

The second pillar of PIFC is an internal audit. Standards for internal audit are based on the International Standards for the Professional Practice of Internal Auditing (issued by the Institute of Internal Auditors (IIA). Internal Audit is an independent, objective persuasion and consultancy activity designed to add value and improve the organization's business. It helps the organization to achieve its goals by providing a systematic, disciplined approach to evaluating and improving the effectiveness of risk management, controls, and management processes (Tušek et al., 2014). The goal of the internal audit is to provide services that should help executives in managing with the institution effectively, to examine if the implementation of management and control mechanisms is appropriate, economical and consistent in relation to legal regulations, internal acts, contracts and other regulations and to provide recommendations and advices regarding audited activities.

The Central Units for Harmonization and Coordination of the Financial Management and Control System and for the Internal Audit Methodology is an integral part and prerequisite for a successful development of the public internal financial control system and it is the main component of the PIFC. The Central Harmonization Unit is responsible for development and application of the methodology and standards for financial management and control systems, as well as internal audit in the public sector. In particular, it focuses on the development of procedures for financial management and control, as well as on development of manuals, internal audit guidelines and ethical rules for employees involved in internal audit.

2.1. Control environment and legal framework of PIFC in Republic of Croatia

The PIFC framework is consisted of two parts that cooperate to provide reasonable assurance that internal controls function appropriately and effectively: Financial Management and Control - the need to strengthen the governance over internal control processes. Functionally independent and decentralized Internal Audit (IA) evaluates effectiveness of internal controls. The Ministry of Finance is responsible for establishing and development of the PIFC system in the Republic of Croatia. The Central Harmonization Unit of the Ministry of Finance is responsible for internal financial control system establishment and development coordination. The Central Harmonization Unit as a separate unit that develops and directs the PIFC process is, among other things, responsible for setting standards for internal control and internal audit and it should help to ensure that these standards are maintained at the appropriate level of quality. However, the final responsibility for the establishment and development of the PIFC system is on ministers, heads of budget users and other senior executives who are specifically responsible for this system. They are responsible for establishing and ensuring the proper and effective functioning of PIFC in their organizations.

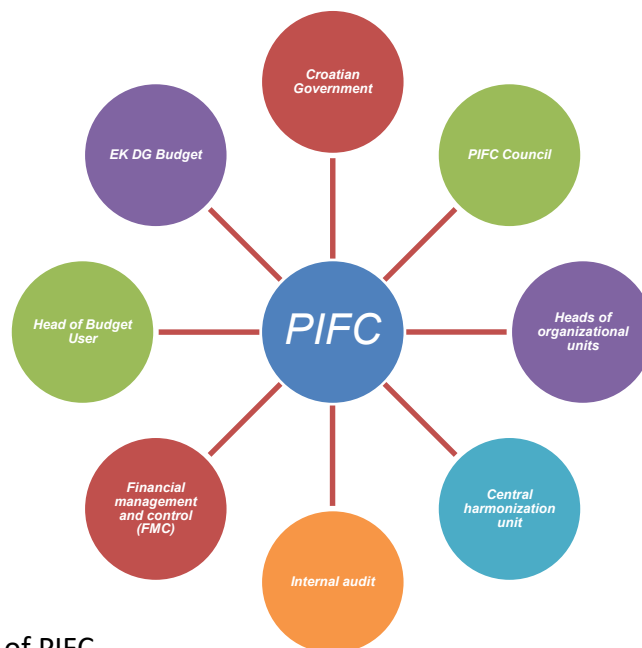


Figure 1 Participants of PIFC

The Republic of Croatia was in process of joining EU (in accordance with Chapter 32 - Financial Control) obliged to adopt and implement the Law on Internal Financial Control System in

Public Sector as well as related policies that will support its' adequate implementation. All necessary laws and regulations required by first criteria in Chapter 32. - Financial Control was adopted by the end of the year 2008. The development of the new PIFC platform was a significant step taken by the Republic of Croatia in order to insure good governance and use of national and EU funds and therefore to be prepared for becoming a new member of the European Union. This PIFC platform has been included in the Law on Internal Financial Control System in Public Sector (Official Gazette 141/06 - the Law). The provisions of the Act promote the implementation of the managerial responsibility, the design and establishment of an efficient financial management and control system as well as an independent and effective internal audit in public sector. (<https://www.finance.gov.mk/files/u10/PricucnikFMC.pdf>).

Budgetary accounting in the Republic of Croatia is regulated by the Budget Act (NN 87/08, NN 136/12 and NN 15/15), the Act on Execution of the State Budget, which should be issued each year, the Rulebook on Budgetary Accounting and the Accounting Plan (NN 114 / 10, NN 31/11 and NN 124/14) and the Rulebook on Financial Reporting in Budgetary Accounting (Official Gazette 32/11 and 03/15). Entities that should apply these laws and regulations are; the state budget, budget of local and regional self-government units and budget users of the state budget and budget users of the budget of local and regional self-government units. The Law on Fiscal Responsibility (NN 139/10 and NN 19/14) defines the rules which limits the spending of public funds, strengthens the responsibility for lawful and purposeful use of public funds. Moreover it strengthens the control and supervision system to ensure fiscal responsibility. The aim of this Law is to ensure and maintain fiscal responsibility and transparency and to ensure sustainability of public finances in medium and long-term. (Law on Fiscal Responsibility, NN 2010/139; Articles 1 and 2). The strengthening of financial management begins with the adoption of the Law on the System of Internal Financial Control in the Public Sector (NN 2006/141). Central Harmonization Unit for Internal Audit and Financial Control at the Ministry of Finance has taken steps to define business procedures at budgetary users in order to ensure business uniformity, to determine responsibilities in business activities, and to define deadlines for annual reporting. These procedures enabled the improvements in budgetary users' business, visions and missions, improved transparency and influenced the reduction of costs and business risks. The Strategy for the Development of the Internal Financial Control System in the Public Sector of the Republic of Croatia for the period 2009-2011 defines the objective for further development of system for budgetary management by establishing stronger transparency within the budgetary system. Head of the budgetary user confirms in The Statement of fiscal responsibility the responsibility for the lawful and purposeful spending of budgetary funds, and the establishment of a financial management and control system for a period of one financial year. Later, a new strategy for the period 2012-2013 was adopted. Key areas and activities for the development of the system of internal financial control were: development of financial management and control (following the same objectives set out in the previous strategy), internal audit development, the Central Harmonization Unit's co-operation with budgetary users on the state and local level who should implement financial controls in its daily activities and the active involvement of the Internal Financial Control Board in the public sector.

2.2. Development of the PIFC system in Republic of Croatia

The effective date of Law on Internal Financial Control System in Public Sector (NN.141 / 06) was January 4, 2007. It established the methodology, standards, responsibilities and the competence of the Ministry of Finance and other bodies in the implementation of the internal financial control system in the Croatian public sector. Moreover, the law harmonizes Croatian legislation with the EU regulations in the area of internal financial control in the public sector.

Internal financial control in the Croatian public sector includes some principles EU *acquis communautaire* established by the European Union as a comprehensive system of internal financial controls for the good governance with public funds. The internal financial controls system in the public sector is defined as the comprehensive system of financial and other controls established by the public managers in order to successfully manage and accomplish the tasks of the budgetary users. The Central Harmonization Unit for Harmonization of Internal Audit and Financial Control at the Ministry of Finance is responsible for coordinating the establishment and development of the internal financial control system in the public sector. This Law should be applied by budgetary users and extra budgetary institutes or funds.

In order to establish and develop efficient financial management and control system in the public sectors and to achieve the higher quality of business within the public sector in the field of finance, it was necessary to:

- Raise the level of financial management awareness as an integral part of the public sector governance process and raise the level of financial management and control awareness of officials on their roles and responsibilities.
- Develop the co-ordination roles of the existing administration/sectors/financial departments in a way to accept the role of coordinators in the development of financial management and to provide support to other institutions' executives in developing financial management throughout the organization.
- Develop an accounting system to provide more detailed data on costs, revenues, assets, liabilities and profit/loss, in order to plan and execute budget more effectively, to control costs and liabilities, to identify possible savings, and to achieve the necessary efficiency.
- Improve the quality of risk management at the national level and to implement a systematic approach to risk management at the local level in such a way that risks are continuously evaluated. Furthermore, budget users should appoint employees who will monitor risks and be in charge for reporting on those risks (Mahaček et al., 2016).

Year	Activities
2008.	<p>Activities on realization of adopted Plans for establishment and development of financial management and control. Previous activities have largely resulted in documenting business processes and determining their goals, ie books/business process maps have been created.</p> <p>Concrete activities</p> <ul style="list-style-type: none"> • Development and implementation of policy and methodology related to the legislative framework and international standards in the field of internal financial control system, • Strengthening administrative capacities related to the establishment and development of financial management and control and internal audit, • Education of employees for conducting financial management and control and internal audit, • Implementation and development of the internal financial control system at budget users, • Coordination of implementation and development of the financial management and control system and the establishment of internal audit units with the budget users.
2009.	<p>During 2009, activities on the development of the system of internal financial controls were intensified. Special emphasis was put on linking the development of this system and budget system and on coordinated approach to the development of the internal financial control system for the purposes of national funds management and the management of funds from EU pre-accession funds.</p>
2010.	<p>The further development of this system is determined by the Strategy for the Development of the Internal Financial Control System in the Public Sector of the Republic of Croatia for the Period 2009-2011. The fundamental feature of further development was to fully integrate the system of internal financial controls into the existing management processes and put it in the function for development of the budget system. Therefore, year 2010, as the first year of the implementation of the objectives and measures outlined in the strategic document, was characterized with the detailed analysis of the existing financial management and control systems for budget users and with the strengthening of links between the internal financial control system and the budgetary system.</p>
2011.	<p>During 2011, further progress has been made in the area of regulation and methodology, primarily by creating solid bases for the integrated development of internal financial control systems with development in the budgetary system. It should be emphasized that the adoption of the new Rulebook on the implementation of financial management and control in the public sector linked the key provisions of the three basic laws related to the financial management and control system: Budget Law, Law on Internal Financial Control System in Public Sector and the Law on Fiscal Responsibility. Practical implementation of the internal financial control system in the part of financial management and control has resulted in further development of strategic planning. In 2011 the counties did not strengthen the internal audit capacities.</p>

Table 1 Development of PIFC from 2008 to 2012 with emphasis on counties

Source: Adjusted: The consolidated annual report on Internal Financial Control in the Public Sector of the Republic of Croatia for 2008, Ministry of Finance 2009. [Online]. Available from: <http://www.mfin.hr/adminmax/docs/Objedinjeno%20GI%20za%202008..pdf> [Accessed: 10 February 2019], The consolidated annual report on internal financial control in the public sector of the Republic of Croatia for 2009, the Ministry of Finance, 2010. [Online]. Available from: <http://www.mfin.hr/adminmax/docs/Objedinjeno%20GI%20za%202009..pdf> [Accessed: 10 February 2019], The consolidated annual report on internal financial control in the public sector of the Republic of Croatia for 2010, the Ministry of Finance, 2011. [Online]. Available from:

<http://www.mfin.hr/adminmax/docs/Objedinjeno%20GI%20za%202010..pdf> [Accessed: 10 February 2019],
The consolidated annual report on Internal Financial Control in the Public Sector of the Republic of Croatia for 2011, Ministry of Finance, 2012 [Online]. Available from:
<http://www.mfin.hr/adminmax/docs/Objedinjeno%20godisnje%20izvjesce%20o%20PIFCu%20za%202011.pdf>
[Accessed: 10 February 2019]

3 Methodology

3.1. Research design

The survey of the counties budgets in Croatia (20 counties) covers the 10-year period from 2008 to 2017 (n = 10). In the analysis were included three groups of data taken from the consolidated annual reports on internal financial control in public sector of the Republic of Croatia and the documents of the Ministry of Finance of the Republic of Croatia on the realization of the local government budgets for the period 2008 - 2017:

- financial data on counties' budgets (data from group A);
- data on detected irregularities in the Questionnaire on Fiscal Responsibility (data from group B);
- data from the Parts of Fiscal Responsibility Questionnaire (data from group C).

The financial data was complete but due to its shortness and transparency numbers were presented in millions of kuna (national currency). However, data on observed irregularities (data from group B) were missing for the first four years of the observed period. Also, the data from the Fiscal Responsibility Questionnaire (Data from Group C) were incomplete, missing for the first four years of the observed period. The reason for the lack of these data is the evaluation of consolidated annual reports on internal financial control in public sector of the Republic of Croatia. Namely, in the initial period of publication of the mentioned reports, the total (comprehensive) data was presented, and data for the counties were not presented separately until 2012 and 2014. In spite of these inconsistencies in the two groups of data, the analysis was conducted to detect some tendencies in counties budgets, and to investigate the contribution of effective management, control system and internal audit establishment.

The collected data were insert in the excel file from which they are converted to the SPSS file. Statistical analysis was conducted on the basis created database (by SPSS Statistics for Windows, version 17.0), while the charts were created with the help of Microsoft Excel 2010. To reach research goals following statistical methods were applied: tabular and graphical representations, relative numbers, mean values, simple correlation analysis, change rate, and linear trend.

The results of the analysis are presented and described in three parts:

- statistical analysis of financial data;
- statistical analysis of data on irregularities noted in the budgets;
- statistical analysis from the Field of the Fiscal Responsibility Questionnaire.

3.2. Data analysis

3.2.1. Statistical analysis of financial data

Table 2 presents the most important financial data on counties accounts, while in Table 2a and 2b, other financial data from these budgets are presented. All tables present most important descriptive indicators.

Table 2 Total revenues and cash inflows in budgets of counties in Croatia and surplus/deficit of revenues and cash inflows in million kn

Year	Total revenues and cash inflows in million kn	Surplus/deficit of revenues and cash inflows
2008	3742,3	-49,8
2009	3697,7	-64,7
2010	3518,9	0,1
2011	3506,7	53,3
2012	3535,6	44,4
2013	3706,7	-69,5
2014	3808,1	63,1
2015	3793,2	24,0
2016	3798,0	34,6
2017	4099,2	57,2
Total	37206,4	92,7
Average	3720,6	9,3
Median	3724,5	29,3
Change rate	+1,0	-201,6

Source: Crated by authors

Total revenues and cash inflows in counties budgets for the last 10 years were between HRK 3.5 billion (2011) and HRK 4.1 billion (2017). In the initial stages of the observed period (recession period), total revenues and cash inflows slightly reduces from year to year while since 2012 they begin to continuously grow (Graph 1). Average annual revenues and cash inflows were HRK 3.7 billion kuna with a standard deviation HRK 1.78 billion kuna which indicates increased dispersion (coefficient of variation was 48%). The amount of total revenues and cash inflows of the last observed period was 9.5% higher than the amount of total revenues and cash inflows of the first year of the observed period. The average annual growth rate of total revenues and cash inflows in the period from 2008 to 2017 was 1.0%. The average annual absolute growth of total revenues and cash inflows in counties' budgets is 38.6 million kuna (equation of the linear trend in graph 2).

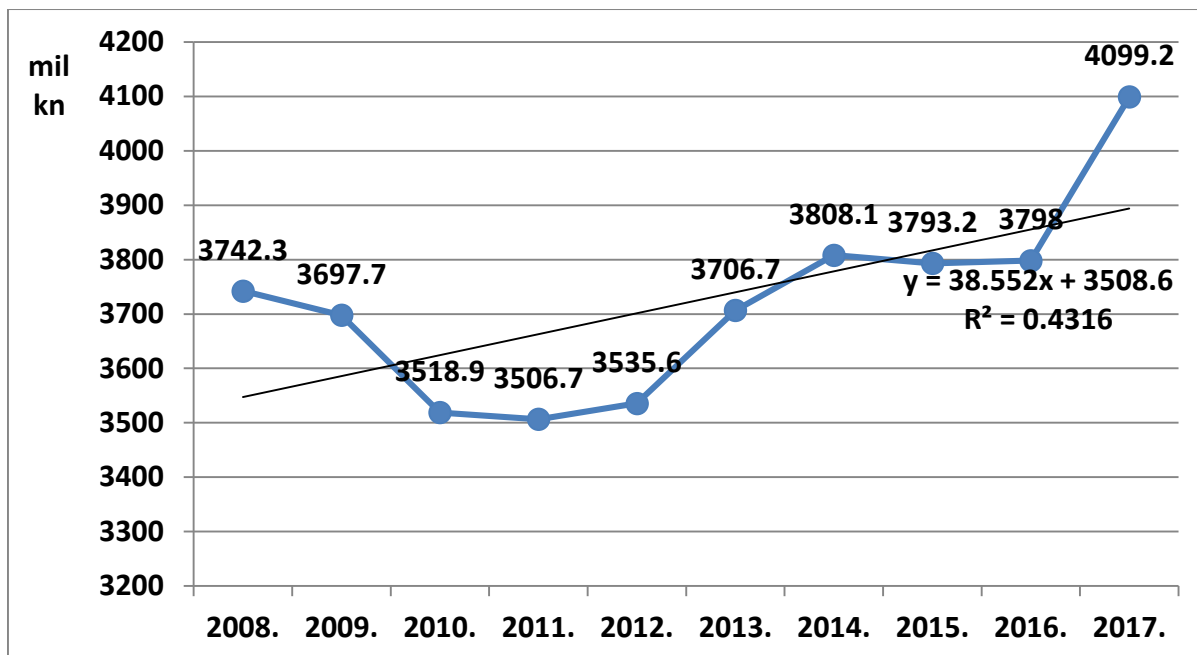


Figure 2 Total revenues and cash inflows in budgets of counties in Croatia from 2008. To 2017.

Surplus or deficit of revenues and cash inflows in the observed period shows significant variation (Figure 3). Revenue and income surpluses were recorded in seven years, while deficits were recorded in three years. The deficits were recorded in the initial recession years (2008 and 2009) and in 2013. The average annual surplus in the observed ten-year period was 9.3 billion kuna. Due to large variations, the standard deviation was five times higher than the arithmetic mean. Therefore, the median is a better mean value than the arithmetic mean, and it is 29.3 billion kuna.

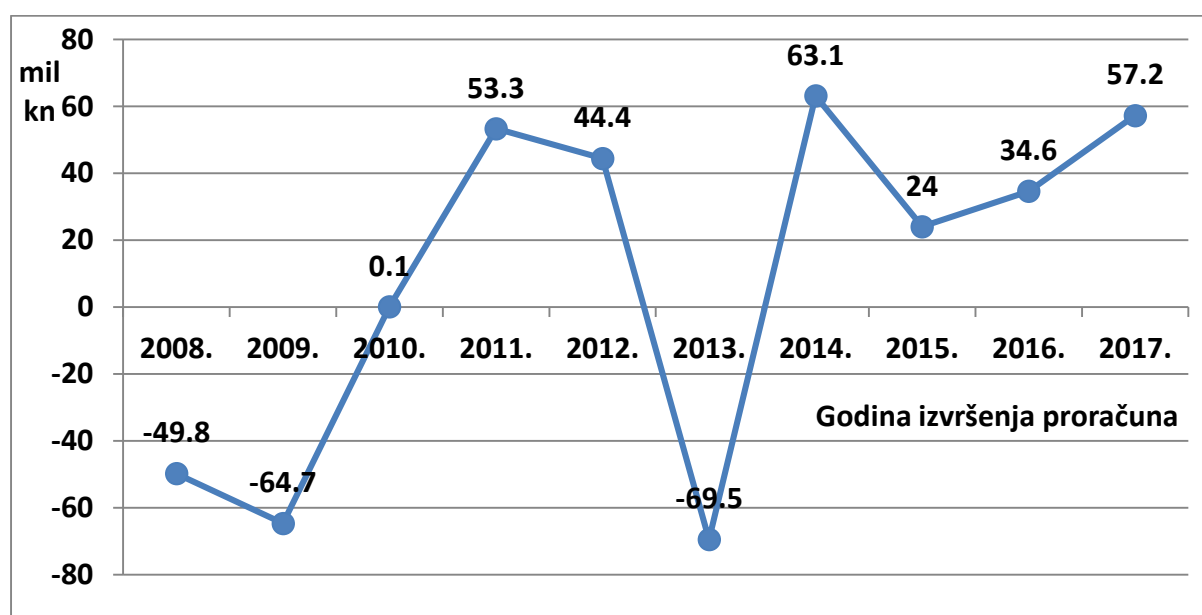


Figure 3 Surplus/deficit of revenues and cash inflows in the budgets of counties in Croatia from 2008 to 2017

Table 3a Financial indicators of counties' budgets in Croatia in the period from 2008 to 2017 in million kuna

Year	Revenue surplus	Revenue deficit	Revenue surplus – non financial assets	Revenue deficit – non financial assets	Total revenue surplus
2008	538,4	0,0	0,0	598,2	32,3
2009	513,9	0,0	0,0	575,2	47,7
2010	548,4	4,6	0,0	561,5	51,8
2011	470,2	0,0	0,0	421,8	70,3
2012	457,7	0,0	0,0	390,5	80,0
2013	523,2	0,0	0,0	518,2	59,3
2014	600,4	0,0	0,0	476,0	134,8
2015	328,4	6,3	0,0	232,8	135,3
2016	245,4	29,6	0,1	224,4	70,5
2017	248,6	10,6	0,0	157,36	117,7
Total	4474,8	51,1	0,1	4156,0	799,7
Average	447,5	5,1	0,0	415,6	80,0
Median	492,1	0,0	0,0	448,9	70,4
Change rate	-8,2	-	-	-13,8	+15,5

Table 3b Financial indicators of counties' budgets in Croatia in the period from 2008 to 2017 in million kuna (II part of Table 2a)

Year	Total revenue deficit	Revenue surplus – financial assets and liabilities	Revenue and cash inflow surplus	Revenue and cash inflow deficit	Revenue and cash inflow surplus/deficit
2008	92,1	57,6	47,7	19,4	69,2
2009	109,0	52,1	55,6	21,1	85,8
2010	69,5	55,0	37,3	25,4	25,3
2011	21,8	44,8	39,9	74,4	21,1
2012	12,8	52,1	74,9	67,8	23,4
2013	54,3	9,0	83,5	25,4	94,9
2014	10,4	4,8	66,0	85,6	22,5
2015	46,1	13,9	79,1	67,4	43,5
2016	79,0	71,8	28,7	107,4	72,8
2017	36,9	21,3	44,9	106,4	49,2
Total	532,0	382,4	557,5	600,2	507,6
Average	53,2	38,2	55,8	60,0	50,8
Median	50,2	48,4	51,6	67,6	46,3
Change rate	-9,7	-10,5	-0,7	+20,8	-3,7

Analyses of the numbers presented in Tables 2, 3a and 3b, showed that there are some positive and negative tendencies in elements of counties' budgets. Namely:

- total revenue and cash inflows annually increase by 1.0% (positive tendency);
- the surplus/deficit of revenues and cash inflows annually decreases for high 201.6% (positive tendency as it is a change from deficit to surplus);
- the surplus revenues in average decreases for 8.2% annually (negative tendency);
- the deficit in revenues from non-financial assets in average decreases for 13.8% annually (positive);
- the total revenue surplus increases in average for 15.5% annually (positive);
- total revenues deficit decreases in average for 9.7% annually (positive);
- the surplus of cash inflows from financial assets and liabilities decreases in average for 10.5% annually (negative);
- the revenue and cash inflow surplus decreases in average for 0.7% annually (negative);
- income deficit and cash inflows increases in average for 20.8% annually (negative);
- surplus of revenues and cash inflows decreases in average for 3.7% annually (negative).

3.2.2. Statistical analysis about irregularities noted in the Questionnaire on Fiscal Accountability

Table 4a presents information on number of irregularities noted in the Questionnaire on Fiscal Responsibility in the observed ten-year period, partly unavailable for the initial years of the observed period.

Table 4 Number of irregularities related to counties' budgets in Croatia in the period from 2008 to 2017 presented in Questionnaire on Fiscal Responsibility

Year	Number of Statements	
	Number of Statement on Financial Responsibility without weaknesses and irregularities	Number of Statements on Financial Responsibility with weaknesses and irregularities
2008	...	...
2009	...	...
2010	...	...
2011	...	...
2012	...	...
2013	...	...
2014	4	16
2015	4	16
2016	7	13
2017	9	11
Total	24	56
Average	6	14
Median	5,5	14,5

The data in Table 4 show that the number of statements without weaknesses and irregularities was on average 6 annually and had a (positive) increasing tendency while the

number of statements with weaknesses and irregularities was on average annually 14 and had a (positive) decreasing tendency (Chart 4). From year 2014 to 2017, the number of statements with weaknesses and irregularities was consistently higher than the number of statements without weaknesses and irregularities (on average by 2.3 times, which is negative);

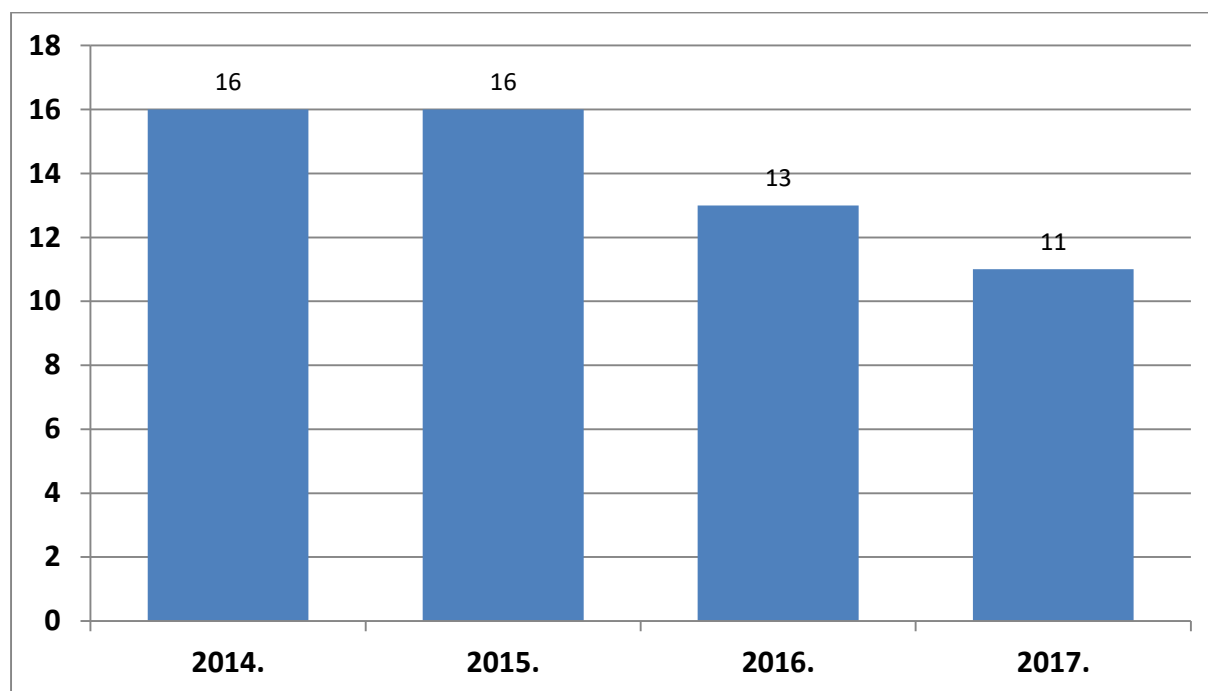


Figure 4 Number of statements with weaknesses and irregularities in counties' budgets from year 2014 to 2017

3.2.3. Statistical analysis of identified weaknesses noted in the Questionnaire on Fiscal Responsibility

Table 5 presents available data from the Questionnaire on Fiscal Responsibility for the observed ten-year period, partly unavailable for the first four years of the observed period. Areas for determining weaknesses in the Fiscal Responsibility Questionnaire are budget planning, budget execution, public procurement, accounting and reporting.

Table 5 Data on the weaknesses identified in the Questionnaire on fiscal accountability in counties' budgets in the Republic of Croatia for the period from year 2008 to 2017

Year	Part of the Questionnaire					Total
	budget planning	budget execution	public procurement	accounting	reporting	
2008
2009
2010
2011

2012	3	38	19	27	14	101
2013	5	58	10	18	9	100
2014	20	51	3	13	13	100
2015	6	30	3	3	9	51
2016	2	23	2	7	6	40
2017	2	11	-	3	4	20
Total	38	211	37	71	55	412
Average	6,3	35,2	6,2	11,8	9,2	68,7
Median	4	34	3	10	9	75,5
Change rate	-7,8	-22,0	-100	-35,6	-22,2	-27,7

Based on the data in Table 4, the main conclusions are:

- The average annual number of statements with observed weaknesses presented in the Fiscal Responsibility Questionnaire is the smallest in part of budget planning and in public procurement and is the largest in the part of budget execution.
- All five parts of Questionnaire show a positive trend in the observed six years. The smallest decrease in the number of weaknesses is noted in budget planning (7.8%) and the highest is noted in public procurement where the number of statements with observed weaknesses decreased from 19 in year 2012 to zero in 2017.
- The total number of statements with observed weaknesses varies between 101 (2012) and 20 (2017), annually average is 69. The average annual decline in the number of statements is 27.7%.

Table 6 Results of correlation analysis

Nb.	Variables	n	Spearman coef.corel. r_s
1.	Surplus/deficit of revenues and cash inflows Number of weaknesses in budget planning	6	0,03
2.	Surplus/deficit of revenues and cash inflows Number of weaknesses in budget execution	6	-0,26
3.	Surplus/deficit of revenues and cash inflows Number of weaknesses in public procurement	6	-0,32
4.	Surplus/deficit of revenues and cash inflows Number of weaknesses in accounting	6	-0,06
5.	Surplus/deficit of revenues and cash inflows Number of weaknesses in reporting	6	0,12
6.	Surplus/deficit of revenues and cash inflows Total number of weaknesses	6	-0,06

All the correlation coefficients listed in Table 6 show a weaker connection, somewhere positive, somewhere negative, and they are not statistically significant ($p > 0.05$ for $n = 6$). Therefore, there is no correlation between the surplus or deficit of counties' revenues and the number of weaknesses observed in counties' budgets.

3.3. Major findings and recommendations

The most weaknesses in counties' Statements on Fiscal Responsibility were identified in budget execution. Although there is a noticeable decrease in the number of weaknesses compared to the previous years. At the county level, the number of identified weaknesses has been reduced in almost all areas of the Fiscal Responsibility Questionnaire. According to the conducted analysis, it can be concluded that the increase in revenues over expenditures during the observed period did not show the correlation between the selected financial indicators and the reduction in the number of weaknesses identified through the Fiscal Responsibility Questionnaire. The reason for this is the insufficient time lag and lack of data for each county individually, which is at the same time the main limitation of the conducted research. However, it is evident that the implementation of the observed system has a significant impact on the counties' budgets namely on the efficiency of budget planning and budget execution, which proves that this system contributes to more efficient spending of public funds and to more realistic planning and higher stability of counties' budgets.

The conducted analyzes of the financial management and control system and of the annual reports of the counties in Croatia indicate the progress towards better systems of financial management and control, which is confirmed by the initiated activities on the development of the strategic planning process, defining indicators of success, developing the risk management process, present practice of developing internal procedures and improving the reporting system. It is necessary to emphasize the contribution of the internal audit, which encourages the development of internal procedures, the strengthening of control mechanisms where the weaknesses were identified, as well as the further development of the reporting system.

4 Conclusion

Transparency of budget users in all business activities, monitoring the cash flows, adequate reporting system with the clear behavior rules of budget users is a prerequisite for development of stable public sector. Public funds "belong" to all citizens and it is therefore extremely important to inform public on how those funds are spent, what programs and activities were financed with such funds, and with what purpose. Clear message to the heads of budget users that the funds should be spent in accordance with previously determined purpose is the basis of a regulated system.

As mentioned above, the financial management and control system encompasses overall business and permeates the entire organizational structure, however, in the focus of financial management and control are revenues, expenditures, assets, liabilities, contracting, and methods for refund of unlawfully spent budget funds. The reason for this is that in these areas (income, expenditures, assets, liabilities, contracts signed, and then realized are visible consequences of total business financial effects, taken or not taken activities, realized decisions, implemented investment projects. Therefore, especially important areas of financial management and control are those related to budget planning and execution, financial plan, accounting, reporting and public procurement. Those areas are also crucial for fiscal responsibility.

The conducted research has shown that implementation of financial management and internal control system has a significant impact on the counties' budgets in terms of increasing

the efficiency of budget planning and budget execution. This proves that the system contributes to more efficient spending of public funds, more realistic planning and higher stability of counties' budgets. Also, the analysis showed that the key areas related to fiscal responsibility (budget planning and execution, accounting, reporting and public procurement) recorded a significant increase in efficiency and decrease weaknesses for 27.7 % in the observed period.

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Management Control – The importance towards Organizational's success – Case Studies

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Abstract: Management Control, over the last few years, has been a discussion and research topic as it assumes from time to time more relevance in business reality. Due to the constant innovational development, organisations, and especially managers, seek for Management Control tools that are appropriate to their needs, to, consequently, perform according to the global organisational need.

Management Control tools enable managers to monitor all information in order to assure decision making, planning and achieving the whole organisational control.

In recent decades Portuguese business structure has undergone sharp adjustments, reflecting changes in competition (China and other Eastern European countries) and in the way to react to adverse external events (such as the recession). Despite of this challenges, the actual business is improving, highlighting that there are sectors that stand out more than others, namely wine, accommodation and catering, and even agriculture and fisheries in certain areas, but with even less economic importance.

Along organisations, small and medium enterprises (SMEs) have the greatest economic relevance as three-quarters of the organisations in the wine sector are SMEs and generate around 70% of the sector's turnover.

Based on this development, SMEs business success has increased supported by internal sets of management tools that are applied by business administrations and managers.

Considering the importance of strategic Management Control tools, such as the interlinkage of the diverse organisational perspectives, Kaplan and Norton developed in the 90's an important performance evaluation tool. This measurement tool, namely the Balanced

Scorecard, is composed by financial indicators that show the results of past actions, of customer indicators related to customer satisfaction, internal processes referring to the potential that the organization has to improve and also learning and growth perspective to lead to good financial performance in the future. Through this four perspectives, this tool characterizes and guides toward the defined organisational strategy, driving to the value creation. On hand of these four perspectives the BSC empowers a strategic analysis directed to the creation of value, focused on mapping and monitoring the strategy of each organisation. This guide will direct managers to act in accordance to the competitive factors that can direct them to the success, interconnecting the operational performance to the strategic objectives. In this sense, strategic maps represent the key characteristics of organisational strategy, as they create relationships between the various objectives and each perspective.

Thus, the strategic map characterizes the whole organisational strategy, describing all the critical success factors of the organization such as the relationship between each of the four perspectives and their cause and effect relationships, showing an objective way of value creation to the entire organizational structure.

Nowadays, recognizing the impact of Management Control tools, several organisations are still implementing management control tools which, undoubtedly, are the driving force for their success, as only the implementation of an effective tool, in accordance to the organisational guidelines, empower the growth and success of the business.

Strategic success is driven by the relationship between the organisational performance, its competitiveness, and the growth and success of its business, according to the implemented organizational strategy.

The aim of this investigation is to confirm the importance of Management Control tools implementation towards business management success. In order to obtain all the needed information and to enable the empirical study of this investigation, a field study, based on detailed and rigorous knowledge of organisations, namely Multi Case Studies have been selected. In this sense, two Case Studies have been developed in two small and medium organisations of the wine sector in northern Portugal. One of these organisations has no Management Control tool implemented, while the other company has already a Management Control tool implemented. So, due to different scenarios, the comparison was even more powerful. Thus, this research focused on the qualitative methodology of an exploratory nature, based on an interview as a part of the Case Studies. The sample was used to study the relationship between management control and business success, to measure and evaluate the results obtained in the time period under study, that is, between 2014 and 2017. This investigation, characterized their structures, management methods and the relevance that they give to Management Control tools to increase performance

The research results demonstrated that Management Control tools are vital for the development and success of the organisational business. In addition, it was confirmed, that

organization with Management Control tools. Based on the research results, we concluded that the main objective of the investigation was achieved, having highlighted the importance that the Management Control tools have for business success, and in particular the benefits that it has brought to the organisational that adopted them, unlike the organisational which does not have the Management Control tools implemented.

This research reveals that despite of the recognized notoriety of the Management Control tools, these are still underdeveloped. Thus, this research intends to highlight the importance of the implementation of the tool through the characterization of management differences between SMEs organizations with and without Management Control tools.

The important role that management control systems has in the financial and non-financial performance of SMEs to achieve business success. In addition, the research showed that SMEs benefit from the implementation of Management Control tools that are appropriate to their needs and realities, consequently, these organisations were encouraged to adopt them, taking in consideration the importance and benefits towards performance and the measurement of strategic objectives.

Keywords: Management Control; Balanced Scorecard; Performance; Family business; SME.

Objective / Introduction

This study has as main objective, to verify if the business success of familiar companies (EF's) may be related to the adoption of certain techniques of Management Control.

Another of the objectives of the investigation was to prove the importance of the implementation of SCG, as a form of business management success. Particularly, through a case study applied to two family companies (EF) in the wine sector, with and without SCG, characterizing their structures, management methods, the relevance they give to the CG and the performance of both companies.

Literature Review

Management Control, over the last few years has been a topic of discussion and research, about which would be the definition that according to the literature best fit the business reality (Ferreira, Asseiceiro, Viera, & Vicente, 2014).

Jordan, Neves, & Rodrigues (2002) and Calderón, Florencio & González (2016) stated that because of the innovations, companies and mainly managers needed to use Management Control tools, appropriate to their needs, personal performance and the reality of organizations.

Management Control being a "new" concept within companies, has become the focal point of all information that helps managers in decision making, planning activities and operational

control of the company, directing human behavior to the achievement of results (Jordan, Neves & Rodrigues, 2011).

Management Control - The Concept and Eight Principles

Management Control was defined by Jordan, Carvalho das Neves, & Rodrigues (2015) as a management tool that encourages managers to make decisions, thus becoming the daily effort that the main managers of companies accomplish to achieve the objectives and the previously defined goals.

For Jordan (2011), the eight fundamental principles of management control are based on the diversification of all the objectives established by the company, on the involvement and participation of all managers with the company strategy, in the fact that management control systems produce reliable information, objective and pragmatic, to serve for the evaluation of organizational performance and to be prepared for decentralization.

Management Control Systems and the Importance of the Controller

The term control should not be of any relevance in isolation, since a control system is much more than a monitoring process, since it is an instrument that allows managers to make decisions and guide their actions in a timely manner, so that reach the ultimate goal (Simons, 1995).

SCGs positively influence managers' behavior because it helps them in decision-making processes, highlighting problems and motivating them to go beyond them to achieve their goals (Mundy, 2010).

The use of SCG allows to promote the organizational capacities of the company, for the orientation of the national and international market (Fijałkowska & Oliveira, 2018).

In an organization, the CdG is seen as the fundamental element that actively participates in the company's processes, producing and providing all financial and non-financial information essential for making strategic decisions (Vicente, Major, Pinto & Sardinha, 2009).

The CdG should manage and coordinate all communication between the different operational areas of the company, making it responsible for all control, but also as a management support specialist, and should therefore make use of all stakeholders in the CG who have coordination, management and dialogue needs Jordan et al., (2015).

Balanced Scorecard - The Concept, the 4 Perspectives and the Strategic Map

Kaplan & Norton, (1992) defined the concept of the BSC as an important instrument of performance evaluation, complementing the financial indicators that show the results of past actions, with indicators of the operational side related to customer satisfaction, with the internal processes and with the potential that the organization has to learn and improve the activities that lead to good financial performance in the future Kaplan & Norton, (1992)

The BSC is considered a strategic management system, based on the existing relationships between perspectives, aiming at the development of management processes, based on the

change of vision, strategy and the relationship between objectives and strategic indicators (Azeitão & Roberto, 2009).

Kaplan & Norton, (2004) argue that the BSC, through its perspectives, is the right model to characterize the strategies devised for value creation.

Kaplan & Norton, (2000) reinforce this theory by presenting and advocating four perspectives in the BSC that allow the creation of a strategic analysis aimed at value creation, namely:

The financial perspective, aims at the strategy of growth, profitability and risk.

The customer perspective, is driving the strategy of creating value and differentiation, based on the perspective of the client.

The internal processes perspective focuses on the strategic priorities of business processes, which create customer and business satisfaction.

Finally, the perspective of learning and growth, has as its main priorities the company's development and the creation of new cultures, such as organizational, innovation and growth.

With the BSC, managers guarantee a management tool focused on the creation of the strategic map of their companies, which forces them to act to the detriment of the competitive factors that can direct them to success, interconnecting, operational performance to the strategic objectives (Amado, Santos & Marques, 2012).

Proof of this is that strategic maps represent the key characteristics of a company's strategy, since they provide the fundamental points for the construction of the BSC, making it possible to understand the company's strategy, how it intends to achieve it and how it intends to create relationships between the various objectives and each perspective (Santos, 2008).

Thus, the strategic map describes the entire strategy of the organization, describing all the critical success factors of the organization and the relationship between each of the four perspectives and the cause and effect relationships, objectively evidencing the creation of value to the entire organizational structure Kaplan & Anderson, (2004).

Family Business - The Concept, Characteristics and Performance, Business Success and Management Control

An EF is a core led by the entrepreneur and co-founder of the company. With this type of leadership, it will be their heirs the future successors that will continue with the work that the founder created (Floriani, 2005).

According to Chrisman (2013) and De Massis et al., (2014 a, b), the main characteristics that distinguish them from non-family companies are: ownership and management.

Although other characteristics of the family, such as philosophy, company vision and business can affect their performance, EFs have important competences, such as human and social, that allow them to maintain good performance (Pedrosa, 2012).

For Astrachan et al. (2002), the performance of an EF business is influenced by ownership, management method applied, family involvement in management, legal aspects, and economic policies of markets and countries of operation.

For Cádima and Santos (2012), in the wine industry, critical success factors such as wine quality, brand, labeling and packaging are key factors influencing the volume of sales of Portuguese wine to the national and international markets. In addition to these key factors, there are also the particularities of the region, climate, soil, history, geography and culture, which are also essential for understanding the success of export sales.

Cádima and Santos (2012) also stated that another of the critical success factors is EF mergers between winegrowers and exporters. These business mergers allow for increased sales and competitive capacity for the domestic and international markets. These mergers stand out for example through lower prices, product quality, the attractiveness of the packaging and the label.

Man (2002) and Colombo and Grilli (2005) state that SE is the relationship between the company's performance, its competitiveness indexes, and the growth and success of its business.

For a company to achieve better performance and its SE, it will have to effectively align the SCG with the strategy implemented in its organization (Tsamenyi, Sahadev & Qiao, 2011).

Methodology

According to Yin (2003) and Real & Ferreira (2014) Case study is a research methodology directed to works, where the main objective is to understand, explore or describe the complex events and contexts, involving several factors that occur simultaneously.

This work focused on a case study, using the qualitative and exploratory methodology, since it presupposes analyzing data collected through the interview method, visits to the companies' facilities to monitor their business activity, data collection in internal documents collection and quantification of the application of internal management control procedures.

Sample - Choice of Companies

Two small and medium-sized enterprises (SMEs) were selected from the wine sector in the northern region of Portugal. The sample served to study the relationship between management control and business success, to measure and evaluate the results obtained in the study time span, ie in the period 2014 and 2017, and the sample was expected to allow an analysis data for the study of the relationship in question.

Data Collection Method

For data collection, consideration was given to the purposes of the study, the human and material resources involved in the study.

The methodological development for the collection of information was divided into three phases:

1. Interview with business management;
2. The direct observation of the activity of the companies;
3. The documentary analysis of the data collected in the companies;

An interview script with a structure and a set of questions based on the work of (Oliveira, 2018).

Presentation and Discussion of Results

This chapter has been divided into two parts. In the first part, we presented the results obtained with the interviews for each one of the companies and, in the second part, we presented the results obtained in the closed answers questions, always in a comparative perspective.

Through the information collected and presented in tables 1 and 2, we can verify that the differences between the two companies in terms of human resources are significant.

The organization with management control privileges gender equality (5 male and 5 female employees), which has employees (1 employee) and operational staff (7 employees), employees with a lot of experience in the area (3 with experience between 5 and 10 years and 5 with more than 15 years of experience) and with training linked directly or indirectly to management. It is notorious here that the company is interested in having qualified employees in its staff.

On the other hand, the organization without management control, despite privileging gender equality (3 male and 2 female employees, does not have in its staff either intermediate, operational or top, many employees with academic training directly or indirectly linked to the management. It only has the certified accountant, who works in an external accounting office. However, many of the employees have more than 15 years of experience in the business sector. This is notorious that the company is not interested in having qualified employees in their pictures.

Analysis of the Results of the Development Questions

In question number two, the answers given by the companies were very similar, and the criteria most pointed out by them were: customer acquisition, customer loyalty and satisfaction, turnover, product quality and internationalization of products and brand, on the part of the organization with management control and the quality of the wine, the collection and satisfaction of customers and the turnover, by the organization without management control.

In the third and fourth questions, the answers given by the interviewees in the the organization with management control showed the great consensus, with a transition of the answers, that is to say, the answer to the fourth question was practically the same as the answer given in the third question.

All respondents responded positively, stating that the company had had business success both in the past 5 years and in the last year. They point to the main key factors for success, customer satisfaction, loyalty and customer satisfaction, the volume of orders, the turnover, and the increase in revenue. It should also be noted that the company has forecast revenue growth of 25% for the last year and only increased by 17%.

It is important to point out that other factors that contributed to the company's success in the last five years and especially in the last one were the expansion of its brand through internationalization and the increase of exports of its products. However, new factors were also indicated that allowed a better understanding of the success achieved by the company, as well as the importance that the SCG had in it, such as: communication among departments, communication among employees, organizational performance, company strategies and the objectives of it.

Respondents in the organization without management control, in the answers to the third and fourth questions, all except the winemaker and the certified accountant, answered yes in the affirmative. The company did not achieve business success neither in the last five years nor in the last year.

The main reasons cited for the lack of success were: strong competition, high wine prices, orders failures, volume shrinkage the existence of diversified products that surpass those existing in the company and the very structure of the company, which does not have the conditions nor support to compete with other partners and competitors of the sector.

The managing partner and the company director stated that the company has not been successful in recent years, and that in the last year even saw a 30% drop in turnover. They are aware that the company has already had a more stable financial situation and that another of the vital points for its failure has been recent negative feedback from customers. This feedback, coupled with the drop in turnover, leads the company to lose customers, decrease revenue and not achieve good business performance.

The seventh question was only put to the the organization with management control, because it was directed to the company that had SCG implemented. This question was very particular because it was directed specifically to the company that already had SCG implemented and because it is divided into two important points of the BSC, that is, organizational performance and strategic changes.

In question a), b) and c), all respondents answered yes again. They justified their responses by stating that the company improved its organizational performance and benefited from the introduction of the BSC. The interviewees also highlighted the fact that with the introduction of SCG and more specifically the BSC, the company improved its organizational performance, communication between departments and between employees.

The BSC also allowed a family SME to redefine itself as a company outlining its priorities, operational activities, business strategies, and processes and working methods, but above all, it has functioned as an important aid in making of decisions for management.

The eighth question was specifically addressed to the company that did not have SCG, and the organization without management control and because it was divided into two important points of the BSC, namely: organizational performance and strategic changes. After explaining the essence and importance of the SCG, the BSC and having presented the results of the evolution and the benefits presented in the other company, practically all the interviewees except the winemaker answered yes yes.

The managing partner and the company director stated that the company compared to the competition does not have the structure and organizational sustainability to compete in the activity sector, it does not have an effective management and it does not have the capacity to innovate and develop its products, for the who consider that the BSC can enable the company to achieve economic recovery and success, creating and developing new strategies, improving its products, work methods and organizational performance.

Final Discussion of the Results of the Development Questions

Through the answers obtained in the questions asked in the two companies, it was possible to verify the differences between the companies with and without SCG.

Although in question number two, the criteria were practically the same in the two companies, that is, customer acquisition, loyalty and satisfaction, turnover, product quality and the internationalization of products and brand, existing differences in the two companies they were noticed when the question of their success was addressed, both in the last year and in the last five years. The answers given by the company's employees with SCG implemented, that is, the organization with management control were very objective, pragmatic and showed an extreme coordination among all, which evidences the interconnection and synergy existing between employees and their respective departments. All respondents stated that the company had had business success in both situations. In addition to being aware of the answers given, it was proven that the information flowed correctly among all and that they are informed of the whole situation of the company. In general, all defended the management model implemented in the company, arguing that due to the strict management in the company, the organizational performance and the respective business success had been achieved.

The company that does not have SCG implemented, that is, organization without management control clearly showed a lack of business reality of the sector in which it is inserted, nor has it achieved business success either in the last five years or in the last year as a result of existing limitations in its management and in its organizational structure. The main consequences for the company not having achieved business success was the fact that it showed a 30% decrease in turnover and customer feedback was negative. This break and this negative feedback, led to the performance of the company had not been the best, and it was going through a less positive period.

Analysis of the Results of the Punctual Evaluation Questions

Regarding what was important for the company, in the company the organization with management control, there was a balance and a tuning in the answers given by all the interviewees, which proves the existence of communication between all employees and their departments, which shows that the same are abreast of all company information. The most important point for this company without a doubt that is the competence and results.

Here, practically all the respondents answered affirmatively with 100 points, being the lowest score was that of the oenologist with 70 points. However, the company and its employees are well aware that it is not enough to focus only on financial results, because in order to achieve them, the company must have a good performance in the others, that is, in human resources, new challenges and permanence and stability.

Proof of this is that the company attaches great importance to its human resources and to its permanence and stability. In the human resources, although the director and the winemaker gave the lowest scores, with 60 and 65 points, the remaining employees gave maximum or almost maximum.

The point that scored the least was the new challenges, where the lowest score was given by the certified accountant and the administrative accountant with 50 points respectively and the highest score was given by the production staff with 100 points. The scores given, demonstrate that the company to achieve the good results seek to create a balance between all components analyzed.

In organization without management control, the scores attributed in this question demonstrate well that competence and results (340 points) represent the most important point for the company and its employees. The management with scores of 80 and 90 points along with the administrative person with 100 points contributed the most to this score.

However, it is worrying to see the enormous difference that exists for the other components. Human resources have a total of 140 points, new challenges have 90 points and permanence and stability has 165 points, which gives a difference of 175 points from the second to the most punctuated component. Here we can conclude that the company does not give importance to all the other components that contribute to the achievement of good results, there being no consensus or coordination in the scores given by the workers.

Concerning the question of the weight of the perspective, the results obtained in the interviews carried out to the employees of the organization with management control and organization without management control were:

Regarding the factor of the perspective, the results obtained in the interviews carried out to the organization with management control and organization without management control employees were:

Based on the results obtained, it was verified that the company with SCG implemented, that is, the organization with management control, benefited from the adoption of the BSC in its business management because it obtained better results and an increase in its performance, instead of organization without management control, which besides not having SCG

implemented, presented a management with several limitations, which prevents it from obtaining good financial and operational results.

The two companies have common characteristics as regards ownership of both, and these are under the domains of their families. In the case of the organization with management control, the SG is the father and the director the daughter. In the case of the organization without management control, the SG is the father and the director is the son. This is defended by Sharma, Chrisman and Chua (1997) and by Glassop and Waddell (2005), when they affirm that PEs are characterized by the management of their companies, being owned by family members.

The companies included in this case study, being SMEs, have an average of 39 (the organization with management control) and 48 years (organization without management control) of age, as well as many years of experience (over 15 years) in the activity sector, which could initially allowing them to conclude that they had experience and knowledge of the sector of activity where they were inserted and that could be differentiated by the positive of their direct competitors, increasing their revenues and later, better all their performance.

Anderson and Reeb (2003) argue that older firms are those that are most adverse to change, with the main feature being conservative management that makes it limited in terms of business growth.

Proof of this is the fact that Miralles-Marcelo et al. (2014) argue that smaller and younger companies perform better than older and larger ones.

The same authors (Miralles-Marcelo et al., 2014) justify this theory, stating that smaller companies are more concerned with business performance.

In the company the organization with management control, the SG has a vast knowledge about the entire activity sector, but mainly about the entire operational aspect of the business. The same, when he decided to implement the SCG in his company, felt the need to reinvent his company recruiting elements to form a professional team and with experience in the area of management, because only then the process would succeed. Proof of this is that the company has internally a CdG licensed in Management, a CC licensed in Accounting and a Master in Management and a commercial licensed in Marketing. Already in the the organization without management control, the SG, despite having knowledge about the activity sector, at the level of the business management such as the director licensed in civil engineering and other members of the company, presented great limitations, what harms not only him, but the throughout the company in general.

Proof of this is that Freitas and Krai (2010) argue that the SG of each family business should improve management knowledge because the renewal of knowledge and the development of professional aspects are essential for PEs.

Hansen (2006) and Wiley (1999) defend this theory by stating that there is a need to define professional competence, but above all, to identify the people with the best skills, knowledge

and skills that allow and contribute to the company's success improve your business and your performance.

Regarding the criteria that characterize the company as being a successful company in the activity sector, the differences between the companies were quite notorious. In the criteria of success, the organization with management control employees pointed out the turnover, the business strategies, and the quality of the product, the acquisition, satisfaction and customer loyalty. Instead, those of the organization without management control only mentioned turnover, product quality and customer satisfaction.

Langfield-Smith (1997) and Gani and Jermias (2012) argue that SCGs should be created and adapted to support the company's business strategy in order to achieve superior performance because they are fundamental in the implementation of business strategies. Already Oliveira (2013), adds that the turnover, stimulates the increase of the performance of a company through the results obtained by it.

As for the success achieved by the two companies in the last five years and in the last year, the differences between the two companies were clear, especially between the one that has SCG implemented, that is, the the organization with management control, and the one that does not have SCG implemented, ie the organization without management control.

The the organization with management control has had business success both in the last five years and in the last year. The company stands for its success, based on increased turnover and increased revenue, customer loyalty and satisfaction, with significant improvements in product quality, with new working methods, implemented by the introduction of SCG, the improvement of communication between employees and departments, the expansion of the business and the internationalization of the products and the brand, the strategies and objectives of the company. It should be noted that the company in the last year despite having maintained business success, had anticipated a 25% increase in revenue and only managed to increase 17%.

In the reverse direction the organization without management control has not achieved success in the last five years, and the failure has been extended in the last year. It is notorious that the company does not present an effective management, since the justifications for the failure were based on the strong competition, the unfair and competitive prices, the lack of organizational structure, the lack of diversified products, the innovations of the sector, the order drop and revenue decline. In addition, in relation to revenue and turnover, the company recorded a fall of 30%, which has caused considerable financial loss to the company.

SC Simons (2000) and Widener (2007) argue that SCGs play a fundamental role in companies because they enable them to achieve competitive advantage and achieve business success in the face of uncertainty and economic difficulties.

Regarding the fact that companies have implemented SCGs and the contribution they have had or could have on organizational performance and business strategies, the approaches have been quite different.

The organization with management control was clearly ahead of the introduction of SCG. It benefited, with an increase in organizational performance, from a new communication existing between employees and departments (which until the date of implementation was

little or almost nil), with the improvement of methods and work processes, with the expansion of the business, but above all, thanks to the BSC created taking into account the reality of the company and its sector of activity, the company was able to define priorities, define business strategies, define new objectives, better control all operational activities and be prepared for any scenario less positive.

In organization without management control, the approach was different, that is, as the company does not have SCG implemented, it was asked if it would welcome the introduction of the same. Furthermore, the case of the competing company which already has SCG, ie the the organization with management control, was exemplified in this case. The answer was clear, that is, if it is to improve the company's performance and develop it, if it is to improve products and management, to create a strategy that allows us to create business sustainability and achieve good results, SCG you will be welcome.

Simons (1990) and Burney & Widener (2007) argue that their use provides managers with useful information for decision-making, planning and evaluation of the company's activities, to combat the scenarios of uncertainty and business complexity that may arise and to be fundamental for the creation of business strategies.

Simons (1995) and Slater and Olson (2001) further argue that SCGs should allow the company to take advantage of all the qualities and creativity of all its employees in order to control the company's business strategies, business objectives and business. Organization, thus obtaining competitive advantages and better performance.

In terms of what is really important for the company, both stated that the component with the greatest weight would be competency and results (930 points for the organization with management control and 340 for organization without management control). However, it was also noteworthy that at this level the company with SCG, that is, the the organization with management control, showed a greater ability to define priorities and more balance towards the remaining components, instead of the organization without management control company that with the evaluation showed that it has no a coherent management, with respect to what really matters most to the company. Proof of this was that the difference between the most scored and the least scored (new challenges) was 125 points and that the scores between the other components were 20 points (permanence and stability - new challenges) of 30 points (rh - permanence and stability) and finally 75 points (competence and results - rh). On the other hand, the organization without management control showed more significant differences, with a difference of 250 points (340 points - competence and results, for the 90 points of the new challenges) from the most to least-scored. The remaining differences were around 50 points (new challenges - rh), 25 points (rh - permanence and stability) and finally 175 points of mue (permanence and stability - competence and results).

Jackson, Schuler and Rivero (1989), define organizational performance as an important indicator for assessing the operational efficiency of a company. Ferreira, Caetano, & Neves, (2011) argues that the performance of employees in a company is viewed through two strands, being: through behavior and through results.

Schneider and White (2004), reinforce this theory, stating that if employees perform a good service, they will create competitive advantages for the company.

In addition, Lev (2001, 2004), Spender and Grant, 1996; Teece, Pisano, & Shuen (1997) argue that much of the company's financial success is related to its intangible resources, and relational.

For Gaynor (2002), one of the most important disciplines of management is innovation, since it allows the company to be focused on looking for new business opportunities that may be appropriate to its reality and strategy, defining actions for success and for new opportunities.

Chen, Li, & Liu (2015) argue that companies should make an effort to implement innovation in their organizational structures through simple incentives and process systems that provide innovation as one of the company's daily priorities.

Finally, Langfield-Smith (1997) report that a business success strategy is based on the relationship between the management decision components, such as marketing, production and investment, which are under the direction of the CG.

With regard to the weight of each of the four BSC perspectives, ie the financial, customer, internal and learning and growth prospects, the capacity and rigor of the organization with management control management exceeded that of organization without management control. In addition to already having SCG implemented, which facilitated the evaluation of each of the perspectives, the company has always demonstrated objectivity and pragmatism in the evaluation of each one of the components of the perspectives, valuing them consistently.

This company values practically all weights from all perspectives, thus assigning equal importance to all of them. Proof of this is its distribution: profitability (28%) and growth (19%) in financial terms, loyalty (24%) and satisfaction (21%) in customers, quality (22%) and efficiency and effectiveness (21%) in the internal dimension and finally satisfaction (23%) and innovation (19%) and qualification (17%) in the learning and growth aspect. This score demonstrates that the organization with management control values all perspectives and all components that create value, a competitive advantage for the company and improve the performance of the company's organizational structure.

In organization without management control, it is well known that profitability in both the financial (52%) and the customer (50%) is important for this company. However, process management (35%) and efficiency and effectiveness (31%) in the internal dimension and satisfaction (57%) in the learning and growth aspect are also important for organization without management control.

It should also be noted that the customer satisfaction component (30%) is one of the most important for the company. Here we can see that the company is focused on specific components of the four perspectives, thus creating an imbalance in what is really important for its structure and management.

To support this analysis, Pinto (2007) argues that BSC was initially simply a model of performance measurement, but that, as a result of its evolution, it became a model of strategic management, strategic communication and change management.

Oliveira, Pinho & Silva (2018) supports this theory, stating that financial indicators translate company strategy through growth, profit and value creation, customer indicators focus on

customer value creation, and internal indicators of learning and growth are characterized by measuring their success in the medium and long term through the flexibility and adaptability and adequacy of intangible assets.

Kaplan & Norton (2004a) emphasize the importance that the alignment of the objectives in the four perspectives has, representing the key factor for the creation of value for the company through a consistent internal strategy elaborated by the whole company.

Finally, the factor of the perspective. At this point and following the analysis made for the weight of the perspectives, we can see once again that the company the organization with management control can distribute and better align the importance of all the perspectives than the organization without management control.

Proof of this is that the organization with management control can align the financial factor (27%) with the customer factor (24%) and the internal factor (11%) with the learning and growth factor (10%). Here we can see that although the company has two distinct relationships, that is, financial side - clients and internal slope - aspect of learning and growth, they can complement each other in a logical, balanced, aligned and adequate follow the percentage differences are not very significant, ie 3% between the financial and customer side and 1% between internal and learning and growth. All this despite the fact that between the least punctuated and the most punctuated, there is a difference of 17%. We conclude that the four factors are aligned according to the company's strategy and objectives (learning and growth - internal - clients - financial).

The organization without management control, on the other hand, can not have an equilibrium in the distribution of importance by the factors of the perspectives. Although in the internal factor and learning and growth have the same score (19%) and the difference for the second most scored is only 2% (customer factor with 21%), the difference for the most scored factor, that is , the financial factor (41%) is 22%, which leads us to believe that the company may even have the same follow-up as the the organization with management control, but besides not being able to effectively share the priorities and importance of the factors, attaches too much importance to the financial factor without relating this directly to any of the other factors. This non-relationship can create serious gaps in the management of the company.

According to Farrel (2003) and Albertin (2004), many managers seek to align the factors and objectives of the BSC's perspective, since this alignment allows them and the company to identify new businesses, increase their competitive advantages and better the company's performance.

Boar (2002) argues that a properly aligned strategy corresponds to the process and actions that the company and its employees carry out to ensure that all functions are rigorously and effectively fulfilled.

Finally, Henderson and Venkatraman (1993) consider that a strategic aligned model is one that contemplates a strategy that can integrate and relate the external environment (market) to the internal environment (organizational structure).

Conclusions

From the results obtained in this work, it was concluded that the objective of the investigation was reached, having demonstrated the importance that the SCG have for business success, and in particular the benefits that it has brought to the company that adopted them, unlike the company which does not have the SCG implemented. The differences in management are very significant.

Originality / Value

This work served to alert the scientific community to the fact that management control strategies are underdeveloped in Portuguese family companies and to the importance of future research on the subject and on the performance of companies before and after the implementation of control systems. Proven benefits and results.

It should also be pointed out that this work served to encourage the creation of a model of multidisciplinary management control for family businesses, taking into account the reality and characteristics of the same and the sectors of activities where they are inserted.

Practical and Research Implications

The scientific work has proven the important role that management control systems have in the financial and non-financial performance of family SMEs so that they achieve business success.

It also allowed us to prove that family companies benefit from the implementation of management control systems that are appropriate to their needs and realities, making them aware of them, alerting them to the importance and benefits of these and making them possible future.

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Attachments

Attachments n.º1: Weight of the Perspective of the Organization with management control

Weight of the Financial Perspective											
	C.G	CC	COM	ADM	DG	SG	ENOG.	FP	FP	FP	
	1	2	3	4	5	6	7	8	9	10	Average
Yield	60%	60%	20%	40%	50%	50%	0%	0%	0%	0%	28%
Growth	30%	20%	70%	30%	20%	20%	0%	0%	0%	0%	19%
Value creation	10%	20%	10%	30%	30%	30%	0%	0%	0%	0%	13%
TOTAL	100%	100%	100%	100%	100%	100%	100%	0%	0%	0%	
Weight of the Perspective Customers											
	C.G	CC	COM	ADM	DG	SG	ENOG.	FP	FP	FP	
	1	2	3	4	5	6	7	8	9	10	Average
Yield	40%	10%	25%	10%	40%	40%	5%	0%	0%	0%	17%
Satisfaction	30%	20%	25%	40%	20%	20%	50%	0%	0%	0%	21%
Retention	10%	20%	25%	10%	10%	10%	5%	0%	0%	0%	9%
Loyalty	20%	50%	25%	40%	30%	30%	40%	0%	0%	0%	24%
TOTAL	100%	100%	100%	100%	100%	100%	100%	0%	0%	0%	
Weight of Internal Perspective											
	C.G	CC	COM	ADM	DG	SG	ENOG.	FP	FP	FP	
	1	2	3	4	5	6	7	8	9	10	Average
Processes management	15%	10%	20%	20%	15%	15%	20%	0%	0%	0%	12%
Rationalization	35%	30%	20%	20%	15%	15%	20%	0%	0%	0%	16%
Quality	20%	30%	40%	30%	30%	30%	40%	0%	0%	0%	22%
Efficiency and efficacy	30%	30%	20%	30%	40%	40%	20%	0%	0%	0%	21%
TOTAL	100%	100%	100%	100%	100%	100%	100%	0%	0%	0%	
Weight of the Learning and Growth Perspective											
	C.G	CC	COM	ADM	DG	SG	ENOG.	FP	FP	FP	
	1	2	3	4	5	6	7	8	9	10	Average
Innovation	30%	20%	30%	25%	35%	35%	10%	0%	0%	0%	19%
Satisfaction	30%	30%	30%	25%	30%	30%	55%	0%	0%	0%	23%
Qualification	25%	30%	30%	25%	20%	20%	15%	0%	0%	0%	17%
Technology	15%	20%	10%	25%	15%	15%	20%	0%	0%	0%	12%
TOTAL	100%	100%	100%	100%	100%	100%	100%	0%	0%	0%	

Source: Own Elaboration

Attachments n.º2: Weight of the Perspective of the Organization without management control

Weight of the Financial Perspective						
	CC	DG	SG	ADM	ENOG.	
	1	2	3	4	5	Average
Yield	40%	70%	80%	0%	70%	52%
Growth	40%	15%	10%	0%	20%	17%
Value creation	20%	15%	10%	0%	10%	11%
TOTAL	100%	100%	100%	0%	100%	
Weight of the Perspective Customers						
	CC	DG	SG	ADM	ENOG.	
	1	2	3	4	5	Average
Yield	40%	40%	60%	40%	70%	50%
Satisfaction	20%	40%	30%	50%	10%	30%
Retention	20%	10%	5%	5%	10%	10%
Loyalty	20%	10%	5%	5%	10%	10%
TOTAL	100%	100%	100%	100%	100%	
Weight of Internal Perspective						
	CC	DG	SG	ADM	ENOG.	
	1	2	3	4	5	Average
Processes management	20%	25%	70%	50%	10%	35%
Rationalization	20%	25%	10%	10%	20%	17%
Quality	30%	25%	10%	10%	10%	17%
Efficiency and efficacy	30%	25%	10%	30%	60%	31%
TOTAL	100%	100%	100%	100%	100%	
Weight of the Learning and Growth Perspective						
	CC	DG	SG	ADM	ENOG.	
	1	2	3	4	5	Average
Innovation	15%	15%	10%	10%	40%	18%
Satisfaction	65%	55%	80%	75%	10%	57%
Qualification	15%	15%	5%	10%	10%	11%
Technology	5%	15%	5%	5%	40%	14%
TOTAL	100%	100%	100%	100%	100%	

Source: Own Elaboration

Attachments n.º3: The Factor of the Perspective of the Organization with management control

Perspective Factor											
	C.G	CC	COM	ADM	DG	SG	ENOG.	FP	FP	FP	
	1	2	3	4	5	6	7	8	9	10	Average

Financial Factor	35%	40%	30%	25%	50%	50%	35%	0%	0%	0%	27%
Customer Factor	35%	40%	30%	25%	30%	30%	45%	0%	0%	0%	24%
Internal Factor	20%	10%	20%	25%	10%	10%	10%	0%	0%	0%	11%
Learning and Growth Factor	10%	10%	20%	25%	10%	10%	10%	0%	0%	0%	10%
TOTAL	100%	100%	100%	100%	100%	100%	100%	0%	0%	0%	

Source: Own Elaboration

Attachments n.º4: The Factor of the Perspective of the Organization without management control

	Perspective Factor					Average
	CC	DG	SG	ADM	ENOG.	
	1	2	3	4	5	
Financial Factor	25%	70%	60%	25%	25%	41%
Customer Factor	25%	10%	20%	25%	25%	21%
Internal Factor	25%	10%	10%	25%	25%	19%
Learning and Growth Factor	25%	10%	10%	25%	25%	19%
TOTAL	100%	100%	100%	100%	100%	

Source: Own Elaboration

Challenges and Opportunities for Crafts and Trade in the Knowledge Economy

Artificial Intelligence and Digital Repository of Crafts Knowledge for Robotic Creation of 3D-Objects

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Abstract: The main question is: How can specific crafts knowledge (applied in handicrafts, craft skills, practical knowledge, techniques, procedures, methods, clues, etc.) be codified as digital media procedures and objects in such a way, that a user and/or a machine can reproduce the artefact? In the era of digitalization, craft knowledge is digitally transformed in two ways: (1) from analogue (written) descriptions to digital files and (2) digital object descriptions containing full guidelines for robotic production. Today, virtual and digital models represented as software objects can easily be created as real 3D-objects by using 3D-printers. A worldwide new maker culture is transforming the handicraft traditions fundamentally. Therefore, the Carinthian Economic Chamber launched the Makerspace Carinthia (see 4.1) in 2018. The Styrian Economic Chamber is currently planning a Center of Excellence, where traditional trade and craft education, combined with the new maker philosophy, will be implemented by WIFI, the Institute for Economic Promotion of the Styria Economic Chamber. Moreover, the Styrian Economic Chamber in Austria launched a “Talentcenter” (see 4.2), where young people from 13 to 15 years of age can explore their talents, in 2016. Finally, the European competition “EuroSkills” (see 4.3) will take place in Graz, Austria, in 2020. Knowledge management and crafts research have been institutionalised in the Institute for Applied Craft Research, Vienna, Austria (see 4.4). The process, which transforms analogue knowledge into digital libraries or repositories is guided by knowledge management principles. These principles may be codified in AI supported rule books which should help to combine digital repositories and meta-repositories, maker spaces and 3D model databases to motivate, educate and train a new generation of producers and craftsmen. The authors introduce a concept for a Digital Content Repository of Crafts Knowledge (DICOROCK) (see 3).

Keywords: Artificial Intelligence, crafts knowledge, repository, mixed reality, 3D-printers

1 Introduction

Knowledge management, which became standard procedure in mature organisations and companies in the mid-1990s, is currently changing dramatically. Until today, the typical role of knowledge management has been to use, collect, share, manage and create knowledge and information. The most common application of knowledge management is still the intranet or ECM (Enterprise Content Management), where employees can find all relevant information and digital workflows (business processes) according to their user access rights and security permissions. A typical intranet nowadays consists of (1) individual login of the employee, (2) search of persons and contents, (3) news and innovations, (4) annual reports, (5) information of the works council, (6) information about the history of the organisation/company, (7) human resource management, (8) finance and controlling, (9) strategy, e.g. balanced scorecard management, (10) data protection, IT-compliance and information security, (11) marketing, (12) research & development, (13) IT department, (14) facility management, (15) legal department, (16) events and event management, (17) learning (webinars, courses, tele-learning etc. (Astleitner and Schinagl 2000)), (18) self assessment tests, (19) e-quiz (Maurer and Schinagl 2007), (20) communities (Korica et al. 2006), (21) procurement, (22) various archives (e.g. technical documentations, business cases, production data, controlling, strategy), (23) ethics, (24) emergency, (25) Wiki (Maurer and Schinagl 2006), (26) bulletin board for employees, (27) lunch buffet plan, etc.

At the beginning of the intranet era, static HTML pages and links to documents as PDF files were standard. Today more and more transactional e-services are being used. Written rules in e.g. compliance documents have been extracted and implemented as e-services, workflows and clickable business processes. ECM has changed in alignment with technological development since 2010. Consequently, major IT trends in business and leisure (Götschl and Schinagl 2003), e.g. smartphones, 4G, apps, cloud, wearables, virtual and augmented reality, big data, robotics, industry 4.0, digitalization, IoT (Internet of Things), blockchain technology, machine learning, artificial intelligence, 5G, etc., have influenced knowledge management significantly. The continuous digital transformation process of the last years shows that static data with interactions and transactions performed by humans have been replaced by complex dynamic data which process and execute cyber-physical, autonomous and largely self-organising systems directly and without human control. In such systems, transactions are performed by machines (currently, humans only control e.g. security, plausibility and performance). A transaction is an action in the virtual world (e.g. clicking on a button in an app), which has an effect in the real world, e.g. to purchase a book in a web store or to switch on the alarm system in the home. Transactionality has overtaken interactivity. The big era of interactivity (Foresta et al. 1993), which can be described as “click-and-look”, is therefore over. Not humans, but data directly, control transactions. Transactionality forces standardization as well as e-service applications and data interfaces to connect applications among each other and to set up a consolidated data pool with all organisational and technical data in a big digital data repository or internal data market (big data). This data market is the source for current and future artificial intelligence data analysis. An internal data market puts a new perspective on knowledge management, because a centralised data pool is a new source of hidden knowledge. Artificial intelligence (AI) and the next generation mobile network 5G (Schinagl 2018a), as well as virtual/augmented/mixed reality (VR/AR/MR) and

robotics, are the main innovation drivers in the knowledge society (Schinagl 2001) for the next decades.

2 Artificial Intelligence

What is AI today? To put it short, AI is a marketing term to increase software sales (Schinagl 2019). This definition is not ambitious, but very pragmatic, austere and disillusioning. As a motivator and innovation driver, AI should have a broader connotation, e.g. a more human-level AI, or what is typically called “Artificial General Intelligence” (AGI). Nowadays, AI uses two old technologies and one more or less new approach. There are rule based systems, also known as expert systems, machine learning (ML) and deep learning (DL), which appeared more recently. Rule based systems go back to the programming languages LISP (1960s) and PROLOG (1970s) as well as expert systems (1970s). ML originates from connectionism, neural networks and the most influencing publication of James L. McClelland and David E. Rumelhart in 1986: “Parallel Distributed Processes”. DL (since 2000) has been a further development of ML and uses input layers, one or several hidden layers and an output layer of emulated neurons (nodes). DL performs well at statistical learning, pattern recognition and big data analysis. In short, ML and DL are pattern recognition engines which must be trained using thousands of examples (e.g. pictures, sounds, data patterns). The problem of training data is that the data quality must be very high, e.g. you must show the systems thousands of cats for them to correctly identify a cat in a given picture. The problem for ML and DL is bad data, e.g. if there are lots of rabbits, dogs and cats in the data set, which have all been labelled as cats, then the system does not work properly. Bad data is missing, incomplete, inaccurate, biased or wrong data. If DL was compared to the performance of a child, the child would be able to identify a cat after only a few correct examples. If the child was then shown a crocodile and told it was a cat, the child would immediately recognise the mistake and reject the proposal. Therefore, AI still requires substantial development to reach human levels of intelligence and an AGI is only feasible in the far future. Some AI researchers already predict a next AI winter of long duration. In 2018, Martin Ford published a bestseller called: “Architects of Intelligence. The Truth About AI From The People Building It” (Ford 2018). In it, he presents interviews with 23 people deeply involved in the development of AI, like Geoffrey Hinton, Yoshua Bengio and Yann LeCun, Nick Bostrom, Andrew Ng, Ray Kurzweil, Josh Tenenbaum and others. Geoffrey Hinton, Joshua Bengio and Yann LeCun received the 2018 Turing Award, known as the annually awarded “Nobel Prize of Computing”, worth US\$ 1 million, for their work developing the AI subfield of deep learning. In the last chapter, Martin Ford asks each participant to tell him at what time there would be at least a 50 percent probability that AGI would have been achieved. Five people declined to give a guess. Ray Kurzweil suggested 2029, and Rodney Brooks 2200. The remaining 16 preferred to be anonymous voters. The 18 guesses were: 2029, 2036, 2038, 2040, 2068 (3), 2080, 2088, 2098 (2), 2118 (3), 2168 (2), 2188, 2200. The mean is the year 2099, which is 80 years from now (2019). The “AI Impacts” website (<https://aiimpacts.org/ai-timeline-surveys/>) shows results for a number of older surveys, which cluster in the range between 2040 and 2050. Martin Ford: “If you want to see a true thinking machine, eat your vegetables.”

The authors of this paper believe that the problem of AGI is more fundamental. A computer, or nowadays an artificial neural network, e.g. realized by Nvidia GPUs using special algorithms called deep learning frameworks (e.g. PyTorch, MXNet, TensorFlow, MATLAB, NVIDIA Caffe, Chainer, PaddlePaddle, etc.), is still a syntactical engine using symbol manipulation of zeros

and ones. Both a computer and an artificial neural network know nothing. They even have no information. If we, as humans, talk about information, we mean the information we have, and this is completely different to the information computers and artificial neural networks use. Human intelligence stores and processes information in a way we still do not understand completely. We know some details about neurons and the way signals are transmitted, but we do not know how information, knowledge and experience are codified in the brain. In 1980, the US philosopher of mind John Searle invented the famous “Chinese Room Argument”, where he shows that an algorithmic and symbol manipulating engine, like a computer or an artificial neural network, can never understand anything. For a real understanding, we need a subject, a personal identity (Schinagl 2017; Schinagl 2011; Schinagl 2010), an I, an ego, a consciousness to attach meaning to an object. We need a new concept of information and knowledge, massively extending the concept of bits and bytes. The basis for a next generation AI will be a concept for synthetic consciousness or artificial consciousness (AC). Well known philosophical terms like intentionality and phenomenological consciousness will play a major role in the architecture of new computer systems. Nowadays, a computer has no attention, because there is no consciousness which directs the attention to a certain object. All inner perceptions, known as first-person-view, like the phenomenological and subjective inner experience of joy, pain, sadness, happiness, taste or colour-perception (qualia) are not relevant in today’s computing paradigm. Even if AI does not understand anything, it manages to produce impressive results. Especially fruitful is its role in preparing and opening the market for AGI. Like human intelligence, AGI also needs big data, stored in a repository. A repository is similar to an archive, but in addition to digital objects, it contains data descriptions and relations between objects (metadata). Thus, a repository is a key infrastructure for the prevention of loss of craft knowledge (Götschl and Schinagl 2003a) and a source for a later AGI – therefore the authors propose a Digital Content Repository of Crafts Knowledge (DICOROCK).

3 Digital Content Repository of Crafts Knowledge (DICOROCK)

How is crafts knowledge codified so that artisans can transfer their knowledge to apprentices? Take, as an example, the production of a table, which is usually perfectly achieved by a joiner with the competence of a master craftsman. A typical joiner apprentice needs the average intelligence of a 14 year-old, some competencies in space perception, language comprehension, mathematics and geometry, statics, design, special knowledge of the material properties of wood, how to process wood and safely build wooden objects by using special woodworking tools and other components. An easy way to learn how to build a table is to read a book about table-construction, to watch a video on YouTube, e.g. “How to make a simple table”, to read a wikiHOW, e.g. “The Easiest Way to Make a Table”, or to ask a master craftsman, to show how to do it. The quickest way to build a stable and robust table with a nice design is to learn the procedures from a master craftsman in a joinery, where the tools, different sorts of wood and all components for the production of a table are already available. After two or three tables have been built by the master, where the apprentice has watched the steps of construction, and where the master has instructed the apprentice and has asked for help, the apprentice will soon be ready for making a table alone. The question now is, are there any robots in the world which can construct a table like an apprentice, e.g. by just watching the master craftsman, performing instructions and being a helping hand for the

master? The answer today is no. But of course, there are ways to construct beautiful tables automatically by machines. This is done by complete rationalisation of all steps of production and standardisation. There is a similarity, on the one hand, to build a table in a fully specified script language in a big construction hall with lots of robotic machines (type A) and, on the other hand, with a 3D printer (type B). The scripts are different, but the necessity of standardisation and rationalisation of the processes is equal. For example, to produce tables according to type A, the following simple script is to be followed: (i) order and deliver a selected wood panel from the high-bay warehouse, (ii) put the panel on the wood cutting machine and cut out the selected size, (iii) order and deliver the pre-fabricated wooden table legs, (iv) bring the wooden table plate and table legs into the right position, so that a robotic arm can apply adhesive to the legs and plate, and press them together, (v) check the product, package it securely and deliver it to the sale warehouse. The script for a 3D-printer (type B) is even simpler, especially if a table for a dollhouse should be printed. Thousands of tiny melted plastic slices are printed layer per layer to form a solid object, e.g. our dollhouse table. The description, where the tiny slices should be positioned is provided in a highly standardised digital file representing the 3D geometry. These files usually have the extensions: OBJ, STL, VRML, X3G, PLY, FBX, etc.

3D printing is a fast and cheap way to construct objects for real world applications. The main reason for its success is that the idea for a new object is constructed as a virtual digital object, which directly represents the real object in the real world. There is hardly any difference between the virtual representation of the object in the computer and its materialistic existence - the 3D-printed object - in the real world.

In the industrial production process of type A, lots of individual steps have to be processed, but the 3D-printer (type B) prints out the object immediately in one step. If craft knowledge was to be transformed into a digital representation, the methodology of a 3D-printer, which has the full specification of the object in a digital file, should be analysed. Thus, the question arises, whether it is possible to store not only the whole virtual object, but the whole craft knowledge in a digital representation, e.g. a file, a database or a repository? For many years, the prototype and design process, model building, testing, fitting models in virtual environments, etc. have been fully digitized for mass production on the one hand, and for an individual customized edition on the other. The whole marketing and sales processes have thus been transformed into the digital domain. Only if the real material object is needed, will it be created, produced, built, or printed materially. This is called on-demand production or on-demand manufacturing. In addition to the industrial concepts of industry 4.0, digital and virtual enterprise, a sub-culture of young innovators has emerged. A worldwide new maker culture is transforming the handicraft traditions fundamentally. 3D model repositories like Thingiverse, MyMiniFactory, YouMagine, Pinshape, NASA 3D, NIH 3D Print Exchange, TurboSquid, SketchUp 3D Warehouse, Hum3D, 123D, GrabCad, etc. have been online for several years and many of them offer free 3D models for print. Thingiverse alone offers more than 1.4 million 3D objects to download and print out on a 3D printer. Everybody who owns a 3D-printer is able to create objects on the fly, without the specific knowledge of an artisan. Therefore, we ask will craft knowledge be obsolete in the future, because all objects may be produced by standardised processes using virtual objects on platforms such as Thingiverse? The answer is no, because we need the craft knowledge as a source for scientific research and development. In the procedures of handicraft, knowledge is very often stored as special

experience from several generations. Procedures are also dependent on the cultural background of the artisans. Therefore, the variations of the procedures are new data and subject for scientific research and analysis, e.g. in the manufacturing of healthy food. Scientific discussions about the value of craft knowledge - even historic craft knowledge - is one of many objectives of the Institute for Applied Craft Research in Vienna, Austria.

The authors suggest to create an open source digital content repository of crafts knowledge (DICOROCK) where crafts knowledge will be stored in all digital content types, e.g. scanned handwritten notes, scanned handbooks, scanned books, e-books, links to web sites with specific crafts knowledge, videos, audio books, WIKIs, digital encyclopaedias, historical archives, etc. The crafts knowledge will be primarily categorised according to the catalogue of the branches, profession groups, guilds and committees of the Austrian federal economic chamber (WKO.at). Additionally, this catalogue contains references to the most important classifications of economic activities, e.g. NACE revision 2. The DICOROCK is an open platform and may connect to the database of all Austrian companies, the “FIRMEN A-Z” at the web site <http://firmen.WKO.at>, which was originally developed by one of the authors of this paper, Wolfgang Schinagl in 1999. Companies sometimes have very unique crafts knowledge, e.g. the Hotel Sacher Corporation, which has been producing the world-renowned Sacher-Torte, created by the 16-year-old apprentice Franz Sacher for Prince Metternich, since 1832. If the recipe is a secret – as it is in the case of the Sacher-Torte - then the essential part of the process is missing. Nevertheless, it still makes sense for Hotel Sacher to link its unique products to DICOROCK, e.g. for marketing reasons, showing best Austrian quality and tradition. The DICOROCK platform is based on the video platform <http://WKO.tv>, which is a metadata repository created by Wolfgang Schinagl in 2008 with an own streaming video service. In 2017, the video streaming was transferred to YouTube, and the metadata engine synchronizes video metadata with YouTube WKO channels of the economic chambers of Styria, Upper Austria and Burgenland. Since 2017, WKO.tv is called “WKO.tv Next Generation”, and it monitors the YouTube web site for new videos, also in newly added playlists, in real time. The algorithms use weak AI – a rule-based system – which dynamically adapts to new playlists and new metadata from the YouTube channels. The next stage of WKO.tv will be WKO.AI for Artificial Intelligence. It may use the DICOROCK concept for integrating craft knowledge into Austria’s company database firmen.WKO.at and the multimedia video repository platform WKO.tv. A further development of WKO.AI will describe the architecture of an Artificial Intelligence system, which will automatically collect digital knowledge atoms and objects, classify and generate meta-data, and show examples, e.g. videos, descriptions, link collections and 3D-objects. The major application for phase 1 of DICOROCK is in schools, on-the-job-trainings, polytechnical schools, training centres, universities of applied sciences, etc. and in phase 2 the automatic production of 3D-objects by e.g. 3D-printers and other industrial processes. This repository is also capable of showing demo cases in mixed reality (MR) and will offer interfaces to 3D-printers for robotic production in real time.

4 Social impact of digitalisation and the future of handicraft

Electronics, embedded computers, sensors and actuators, cyber-physical systems, wireless networks, embedded IT-security and especially Internet of Things (IoT) will dramatically influence all professions in the near future. Computing will play a significant role in all economic branches. Many things will get network access for human-machine- and machine-machine-communication. E.g. people can communicate with their heating at home, and their heating communicates with the Outlook calendars of their family members so that the system knows when somebody is home and comfortable room temperature is needed. This will change e.g. the profession of the plumber, who needs knowledge about digital sensor technologies, network interfaces, smartphone apps, etc. In 2012, the single-board-computer Raspberry Pi for about US\$ 35 entered the market and was successfully adopted in the maker culture. In 2019, a completely new device from NVIDIA was released: a single-board-supercomputer for about US\$ 99, called Jetson Nano, which is the new toy for AI programmers using deep learning, neural networks and 4K video resolution at 60 frames per second. Due to the enormous speed of digital transformation we have to ask how plumbers can be up to date with the demands of their customers. The answer is that they need continuous knowledge transfer about the new challenges on the market. DICOROCK offers a digital infrastructure to fulfil such a task. Another prospective infrastructure is a makerspace.

4.1 Makerspace – New infrastructure for Generation Z artisans

The Carinthian Economic Chamber reacted quickly to this new trend and opened a Makerspace (www.makerspace-carinthia.com) in June 2018 for innovative start-ups and entrepreneurs. The makerspace focuses on digital production, industrial 3D-printing, several types of 3D-printers, electronics laboratory, laser cutter, vinyl cutter, paint shop, welding, sandblast cabin, metal and sheet metal processing, CNC milling machine, water jet cutting system, joinery, assembly hall and more. The motivational concept of the makerspace is to explore new ideas, to create and reflect prototypes, to adapt ideas and learn from others, and to implement new ideas into the business world. The makerspace infrastructure should help innovative start-ups to implement their inventions in a creative environment quickly, lowering the risks of long and expensive prototyping cycles. The Styrian Economic Chamber has already a finished building plan and concept for a Center of Excellence, which combines the maker philosophy with traditional education for apprentices and handicraft masters in trade and craft. The Center of Excellence will be integrated into the vocational training facility WIFI Steiermark (Economic Promotion Institute of the Styrian Economic Chamber) and should be probably ready in 2022/23.

4.2 Talentcenter – Support for Generation Z to motivate and find their talents

One of the important questions of our competitive society is matching the right job to the right person. This results in the scientific discipline of talent research. It would be advantageous, if one could take a test that shows, which profession or set of professional abilities best fit their talent. As we know from statistics, young people have problems finding the right education and subsequently the right job. Young people start as apprentices with craft education and find out, that it has been the wrong way and drop out. Dropouts are nowadays a severe problem in job reality, school, higher education, and university generating disadvantages for all individuals and organisations involved. Therefore, the Styrian Economic Chamber (WKO Steiermark) has set up a Talentcenter (www.talentcenter.at) in cooperation

with the University of Graz in 2016. Up to 5000 young people between 13 and 15 years of age are tested each year. Each test lasts for half a day and the test items cover logic, knowledge, motor function and dexterity, receptivity, retentivity and concentration, technical and organisational understanding, individual strengths, etc. The result is a talent report with recommendations for professions and their educational paths. The talent report should provide orientation for the young people and their parents. The results suggest options for a choice to begin a vocational training or higher education - to be motivated and gain a fulfilling job.

4.3 Euroskills 2020 – “We are skills” and “Heroes of Economy”

The Economic Chamber of Styria (WKO Steiermark) is aware of the importance of young talents for a competitive economy. Therefore, WKO Steiermark and the city of Graz applied for Euroskills 2020 (www.euroskills2020.at and www.euroskills.tv) and won. EuroSkills is the European championship of young professionals, a spectacular promotion of skills and most recent skills developments around Europe. Apprentices and young people should be motivated to show their skills and talents in a competition at European level. WorldSkills (www.worldskills.org) is the same championship competition at global level. The goals of EuroSkills are: (i) support of orientation to find the right job, (ii) to get to know the rich spectrum of professions and which professions have great perspective, (iii) motivation for creative handicraft professions, (iv) motivation for new technical professions, (v) increase in value of handicraft professions and professions lacking staff, (vi) platform to show how professions develop and change, (vii) platform to connect companies and young professionals, (viii) platform to show potentials for individual careers based on performance, output and competence.

4.4 Institute for Applied Craft Research, Vienna, Austria

The Institute for Applied Craft Research, Vienna, Austria (Institut für Angewandte Gewerbeforschung) belongs to the Austrian Economic Chamber and was founded in 2016. It is a platform of a broad range of scientists and entrepreneurs interested in the development and transformation of trade and craft to discuss and reflect the challenges of a future society based on new technologies and methodologies. The Institute for Applied Craft Research has a special focus on education and job, society and communications, economy and labour, future and development, ethics and law, technology, art/design and knowledge management.

5 Next generation mobile network 5G, artificial intelligence, mixed reality and robotics

The most important innovation drivers (Schinagl 2018a) for next generation enterprises, production, logistics, research and development are the four key technologies: 5G, AI, mixed reality (MR) and robotics. The main advantages of 5G are high data rates over the air up to 1 Gbps, extremely short delays on IP packets at about 1 millisecond, which is essential for autonomous mobility, and global availability. The main applications of AI in the next few years will most likely be speech recognition, natural language understanding, speech synthesis, vision and pattern recognition, real-time analysis of big data and autonomous systems. Mixed reality is derived from virtual reality (Schinagl 1988) and augmented reality, where virtual objects from a virtual world co-exist with real objects in the physical world and are linked together. This hybrid MR world can be easily entered with a smartphone or with immersive

devices like transparent head mounted displays, where virtual objects are overlaid on real objects in the field of view, e.g. with Microsoft HoloLens 2 (www.microsoft.com/hololens). Robotics is a very wide field with an enormous number of potential applications, e.g. classical handling robots with a robot arm, robo-cars, -ships, -trains, -planes, -toys and – animals, -mowers, -weapons, drones and robo-copters (Schinagl 2018), android robots, nano robots, 3d-printers, and more.

In general, the objective of handicraft is to create, operate, install, edit, transform, maintain, repair, change, safely destroy 3D-objects, and examples are to create a cake, make a table, repair a car, install a window, maintain the heating in the house, etc. Robotics has nearly the same effect as handicraft in principle, but it still lacks flexibility. Robots can operate best in completely standardised environments, where the work process is segmented into tiny tasks with a high repeat rate. Sitting on the terrace in the morning, enjoying breakfast and fine weather and drinking a coffee, people might tell their little robo-copter-drone using speech recognition to fly to the garden door, take today's newspaper out of the mailbox and bring it to them, but it will fail. At least for the next few years, this task is too complex and too general. But in a standardised environment given the garden coordinates, the position of the garden door, the mailbox and the newspaper, drone commands, a drone with a robot arm, etc. the maker scene would find a solution for such a case. This would, however, not be a general solution and not even outperform a trained dog, which could do the same, although not flying.

This example shows that standardisation is the key for automation. But handicraft is very often more unique, customised for very special applications and needs lots of experience and knowledge. The challenge is to bring uniqueness and flexible production together. Robotic production with a 3D-printer accessing a DICOROCK is a first step.

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Traditional Craftsmanship as Intangible Cultural Heritage and an Economic Factor in Austria

Roman Sandgruber, Heidrun Bichler-Ripfel, Maria Walcher

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a) purpose

The UNESCO Convention for Safeguarding of the Intangible Cultural Heritage from 2003 aims at safeguarding intangible cultural heritage through raising the awareness and promoting its standing in society.

Traditional craftsmanship is one area of the intangible cultural heritage of the Austrian Commission. If it is to survive, it is in need of a new self-understanding and increased public awareness of its value to society. Entire occupational fields are threatened with extinction along with their associated bodies of knowledge and skills, and it is high time that these negative tendencies be countered—not only as a sustainable answer to global mass-market production and excessive consumption, but also in the interest of providing future generations with training and career opportunities that are both sensible and promising.

The following study addresses one of the major reasons for this imminent threat of extinction. That is the public's mis-perception of Traditional Craftsmanship and lack of public awareness of its age-long contribution to society and culture. Traditional Craftsmanship was never limited to merely providing products, but as well has always been a crucial factor in developing and shaping our culture and society over the centuries. Elaborating these economic, societal and cultural contributions of Traditional Craftsmanship in Austria in order to strengthen its position, is the main purpose of this study.

b) major theoretical foundation

The Convention defines five domains of intangible cultural heritage, one of them is traditional craftsmanship. During the process of the Convention's ratification and while researching the fifth area "traditional craftsmanship", the Austrian Commission for UNESCO became aware of a Swiss study on the topic¹—and of the fact that comparable basic research had not yet been done in Austria. The Swiss study aimed to examine the present situation of traditional craftsmanship and to develop specific measures and other recommendations for the preservation of traditional trades and crafting skills.

Traditional craftsmanship is important for the Austrian economy², yet it lacks fundamental research on traditional craftsmanship.

c) design/methodology/approach

The presented study discussed traditional craftsmanship in Austria in several questions, especially the most important are:

¹ Haefeli Ueli [et al.], Forschungsmandat »traditionelles Handwerk«, im Auftrag des Bundesamts für Berufsbildung und Technologie und des Bundesamts für Kultur, 2011, Seite 25–27

² WKO Jahresstatistik und Beschäftigungsstatistik 2015 der Sparte Gewerbe und Handwerk,

- Just what is “traditional craftsmanship” understood to be, and/or to what concrete parameters must “traditional craftsmanship” conform in order to be viewed as such today?
- What forms of traditional craftsmanship exist in Austria, and how great are the threats to their respective survival?
- What forms of traditional craftsmanship are significant at present and for the future in terms of cultural and social policy and of the economy?

The term “tradition” is used according to the UNESCO-Commission and the Convention on the Conservation of Intangible Cultural Heritage, Article 2, Paragraph 1.

“Tradition” relates to the English term “transmitted culture”.³ It is a living process, and represents a cultural benchmark to transmit and advance knowledge and skills sustainably over generations. Dynamic traditions do not oppose modernity; on the contrary, such traditions always incorporate modernity. “Culture” internalizes the interplay of dynamics and continuity⁴.

*The intangible cultural heritage, transmitted from generation to generation, is constantly recreated and provides communities with a sense of identity and continuity*⁵

The study understands “*traditional craftsmanship services*” as the production, installation, maintenance, caretaking and repairment of rather individualized goods in combination with services.

For the study, we used a method mix of qualitative and quantitative methods to acquire data. The design was cyclical through intermerging survey and interpretation, while continuously asserting quality of content and methodology. The qualitative primary data collection had the character of an empirical field study. It included concept, implementation and evaluation based on “the qualitative interview”⁶, focus group workshops and in-depth interviews with 67 experts. Followed by the the analysis and evaluation of all audio materials based on verbatim transcription. The quantitative secondary data collection happened through statistics and literature studies, and archive research.

d) findings or conclusions/originality/value

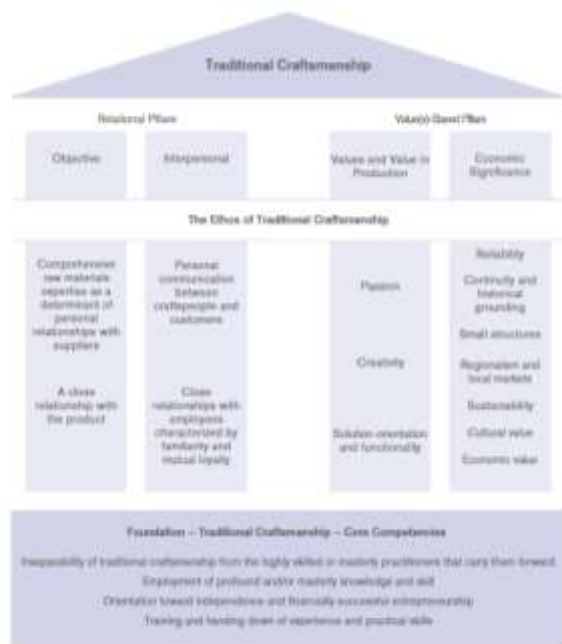
Definition of the term “traditional craftsmanship,” and the specific criteria, that must “traditional craftsmanship” fulfil in order to qualify as such

³ Barkow, J. H., Cosmides L. und Tooby J., The Adapted Mind. Evolutionary Psychology and the Generation of Culture, Oxford University Press 1992, Seite 163 ff, Seite 209

⁴ Noseck Michaela, Was ist Tradition? – UNESCO, <http://nationalagentur.unesco.at/cgi-bin/page.pl?id=18>, 2015

⁵ Noseck Michaela, Was ist Tradition? – UNESCO, <http://nationalagentur.unesco.at/cgi-bin/page.pl?id=18>, 2015

⁶ Froschauer U. und Lueger M., Das qualitative Interview; WUV-Universitätsverlag Wien, 2003, Seite 35 – 41



This graphic defines the fundamental values and contents of “traditional craftsmanship”. It represents the relationships and interplay between them by visualising a foundation plus relevant relational and value(s)-based pillars. The parameters forming the “foundation” are in constant interplay with the elements that make up traditional craftsmanship’s relational and value(s)-based pillars. These elements, in turn, are closely interrelated via mechanisms of causes and effects.

In order to ensure traditional craftsmanship’s medium- to long-term survival, it is necessary that all four of the parameters comprising the foundation be fulfilled. If even one of these parameters goes missing, it is no longer

possible to speak of traditional craftsmanship in the strict sense. The essential defining parameters of traditional craftsmanship included in the foundation therefore represent indispensable core competencies, competencies without which traditional craftsmanship cannot successfully sustain itself and continue to develop.

In contrast to the essential elements listed in the foundation, the degree to which the elements of the relational and value(s)-based pillars are necessary—and/or of the degree to which they are manifested—is flexible. This flexibility is due to the heterogeneous nature of the various fields of traditional craftsmanship, with their differing outputs and/or services. In addition to production, these also encompass installation, maintenance and care of, and repairs to products combined with service-related components, all of which is frequently rather specialised and/ or customised.

Therefore: not every single element of the relational and value(s)-based pillars need necessarily be present in order to speak of traditional craftsmanship. But on the other hand: the less pronounced the characteristics from the relational and value(s)-based pillars at a business are, the less present practically applied, intangible traditional craftsmanship values are at that business.

Traditional Craftsmanship as Intangible Cultural Heritage and an Economic Factor in Austria
 In order to qualify as traditional craftsmanship, the four core competencies of the foundation should be joined by at least one essential defining parameter from each of the relational and value(s)-based pillars that is included in the values brought to bear in a business’s strategic and operative orientation.

Endangering of traditional craftsmanship in their respective existences

The major reasons behind traditional craftsmanship’s endangerment are that trade professions’ decreasing attractiveness and low social status, especially among young people, combined with the constantly decreasing opportunities to earn money and achieve success enjoyed by those who practice traditional craftsmanship on an entrepreneurial basis.

The cultural, socio-political, and economic relevance of traditional craftsmanship of to the present and to the future

On the basis of their role in the economy, businesses practicing traditional trades and skilled crafts perform a multitude of functions that are sustainable, economic, social, and cultural in nature. Businesses practicing traditional trades and skilled crafts make contributions relating to:

- jobs and apprentice positions in their respective regions,
- supplying the local and regional populace with goods and services,
- the availability of products and services that convey a regional and/or national culture and identity,
- social commitment on location and in their surroundings,
- regional anchoring and networking,
- regional value-added chains,
- tax revenues on the municipal, state, and national levels, and
- crisis-resistance and autonomy.

Altogether, Austria is home to 151,558 active trade group members⁷, businesses which represent the traditional craftsmanship occupations in the present study

Each year, these businesses train half of all apprentices. Proportionally, 55.6% of all training business are ones that work in trades and skilled crafts⁸.

Every third Austrian business with employees is an enterprise that provides craftsmanship services as defined in the present study.

Of altogether 2,264,934 employees in businesses represented by the WKO, 537,418 individuals are employed by businesses that can be categorized as involved in traditional trades and skilled crafts⁹.

f) practical and research implications

Based on the research results, further topics for research can be derived:

- Measures to positively influence the image of and esteem for traditional craftsmanship in society, thus enhancing the attractiveness and social status of traditional trades and skilled crafts;
- Measures to improve the competitiveness of businesses practicing traditional trades and skilled crafts, thus contributing to sustainable economic success and higher potential income;
- Measures to improve the specialized qualifications of entrepreneurs and employees via the incentivisation of training and continuing education.

⁷ 2015 WKO annual statistics for the sector "Trades and Crafts", active trade group memberships by trade group

⁸ Dornmayr Helmut und Nowak Sabine, Lehrlingsausbildung im Überblick 2014 – Strukturen, Trends und Perspektiven – Wien, Institut für Bildungsforschung der Wirtschaft, 2014, Seite 4, 17 ff, 84 ff

⁹ WKO, employees in 2015 according to sector and trade group

Changes in Retail and Customer Experience in Knowledge Era

Communication of Corporate Social Responsibility on Official Websites in Retail Industry

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Abstract

Corporate Social Responsibility (CSR) as a research topic emerged in the middle of the 20th century. Numerous papers and studies address the topic from various points of view but there is a scarcity of research studies addressing markets of Central and Eastern Europe. The purpose of the paper is to analyze how retail companies communicate their CSR policies via Internet based on cases of top retail companies in Croatia as a country in Central and Eastern Europe. Firstly, paper will give a theoretical review of CSR definitions and CSR dimensions. Then, follows a literature overview of studies of CSR in retail industry. Third part includes insight into contemporary research of CSR communication via Internet. Finally, ten Croatian retail companies will be analyzed by case study method regarding their official web communication with consumers in the context of CSR. Based on the analyzed cases, conclusions will be derived and some suggestions for improvement in this area will be given. This paper could be beneficial to retail managers when implementing the communication strategy in the area of CSR. On the other hand, the paper could be a good starting point for future empirical research of CSR communication practices in retail, but also in other industries.

1. Introduction

Middle of the 20th century is marked as the beginning of application the Corporate Social Responsibility concept (CSR) in business practice. From that moment on, more and more companies are beginning to apply this concept in their business. Since companies are part of the society within which they operate, it is necessary to take care of that society and conduct their business in a socially acceptable and responsible way. The primary goal of the company is to achieve profitability and fulfillment of the economic goals, but besides that, company must certainly take care of the environment in which it operates. Depending on the activity the enterprise deals with, in the CSR implementation mostly it focuses on one of the dimensions of CSR. A large number of authors (such as Dahlsrud (2006), Slack (2013), Stojanović et.al. (2016), Arsić et.al. (2017)) is dealing with the topic of CSR. Upon their studies

five dimensions of CSR can be observed: (1) economic, (2) social, (3) environmental protection and (5) voluntary dimension.

The contemporary consumer is more and more educated (Kovač Žnideršić, et al., 2013, Beranek and Kamerschen, 2013). When it comes to purchasing decision making, in developed markets, more and more consumers take into account the way in which companies do their business. If a certain company does not operate in socially responsible way, it is accompanied by a bad image, which in many cases has a negative impact on consumers. Therefore, modern companies pay more attention to CSR and apply proactive CSR policies. Moreover, in order to serve educated consumers, contemporary companies recognize the growing need for transparency in communication of their CSR policies to consumers and other stakeholders.

In addition, at EU level there is a large number of regulations, legislative frameworks as well as strategies and policies, especially in the field of environmental protection and care. Some of the EU policies and strategies are: Clean Air, European Union Policies Related to Circular Economy, European Union Waste and Recycling Policies, Green Paper, Seventh Action Program for the Environment (7th EAP), Europe Strategy 2020, and many others. Therefore, EU companies are even more engaged into active implementation of CSR practices.

The questions that are asked are (1) whether the company is doing socially responsible activities only in order to comply with the given provisions and to use it for promotional purposes or (2) does the company really wants to be socially responsible and do something positively for the environment and society in which it is doing business.

There is a large number of papers dealing with this issue and opinions are divided, but in this area, there is a space for further detailed research and analysis. For the purpose of this paper, focus will be on retail businesses and paper will focus on communication of their CSR activities and practice through their websites. The paper is divided into several parts: literature review of CSR aspects in retail industry, overview of CSR communication research, and, primary research results of case studies in retail industry in Croatia.

2. Corporate Social Responsibility and its Dimensions

The idea of social responsibility and corporate social responsibility is already mentioned in practice and literature in the 18th century and is linked to the beginning of the industrial revolution in Europe (Lacković Vincek et al., 2017).

In 1953, Howard R. Bowen published his famous book "Social Responsibilities of the Businessman" and it is one of the first books on CSR. For this reason, in literature Bowen is called a father of CSR. Shortly thereafter, Peter Drucker published the book "The practice of management" in 1954, in which he cites social responsibility as one of eight key areas and necessities when setting business goals.

The largest development and growth of social responsibility concept acceptance was experienced between 1960 and 1970. However, in scientific literature in management, corporate social responsibility (CSR) it is one of widely researched topics since 2009. The process of globalization, information technology development, better information and education of consumers, and the growth of demand for socially sensitive investments were the main reasons for expanding social responsibility practices among contemporary companies (Lacković Vincek et al., 2017).

A particularly important place and position in the analysis and study of CSR has Carroll (1991) with his pyramid of CSR. The model includes four dimensions of CSR, economic, legal, ethical and philanthropic. Note that Carroll model does not explicitly depicts environmental dimension of CSR (see Figure 1).



Figure 1: Carroll's Pyramid of CSR

Source: Carroll (1991)

Over time, models and dimensions of CSR changed. Thus, Dahlsrud (2006), Slack (2013), Stojanović et.al. (2016), Arsić et.al. (2017), complement Carroll's model and talk about the "five dimensions" of the CSR. The dimensions analyzed by these authors are (1) environmental, (2) social, (3) economic, (4) stakeholder and (5) voluntary dimension.

On the other hand, the European Commission (2011) analyses the three basic dimensions of CSR (see Figure 2). Those are: (1) the economic, (2) social and (3) environmental dimension (or environmental protection).

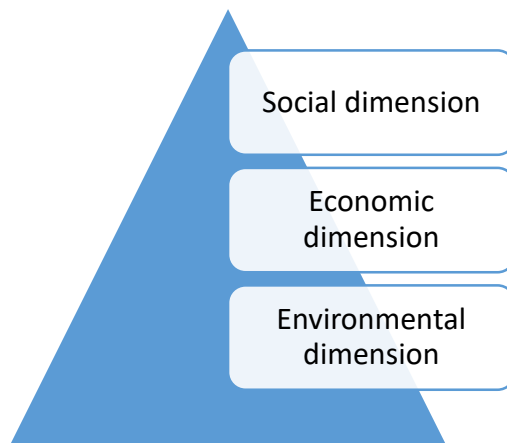


Figure 2: Dimensions of CSR according to the European Commission

Source: Own work according to the European Commission (2011)

Over the time, as social responsibility has developed, this has also followed the emergence of new definitions of CSR. Definitions contain some new elements and an increasing number of them, because of that each of definition puts an emphasis on another element.

Vrdoljak Raguž et al. (2014) define CSR as a specific business concept in which companies voluntarily and without any legal coercion are trying to align their business with the needs of society in the widest possible sense. Therefore, the concept and practice of corporate social responsibility relates to the entire range of corporate activities: what does a company produce, how it produces, which resources it uses, how it buys, sells, how it affects the environment, how it employs, how it relates to employees, how it enables them to work, what are working conditions, how they invest in society and community, do they respect human and labor rights, etc.

Recent research on social responsibility are devoted to issues of poverty, social endangerment, environmental destruction and similar ethical and moral issues.

If the company operates on socially responsible way, it can have many benefits. Kotler and Lee (2009) state that it is possible to conclude that, if companies operate on socially responsible way or according to the concept of CSR, they can accomplish a variety of benefits, such as:

- increase of sales and market share,
- strengthen the internal position,
- strengthen corporate image and influence,
- strengthen opportunities to attract, motivate and retain employees,
- reduce operating costs,
- increase attractiveness for investors.

Glavočević and Radman Peša (2013) make state that applying CSR and socially responsible business practices increase their competitiveness (increased market share, free advertising, higher productivity resulting from increased employee satisfaction, easier access to capital, consumer loyalty) while doing benefits for the community.

Crane and Matten, (2007) foster CSR application in companies due to the following:

- 1) companies have caused many problems (such as environmental pollution), so companies are responsible for involving themselves in solving or at least trying to prevent their further spread,
- 2) the activities of the company in different ways affect the society, for this reason the enterprises cannot ignore such influence, whether it is positive or negative
- 3) enterprises are set up to meet the needs of a large number of interest groups (consumers, social communities, employees, etc.), so they must also take into account their expectations.

Besides the arguments that corporate social responsibility is a moral obligation of the companies, a large number of theoreticians point out that it contributes to increasing the company's competitive advantage (Ivanović, Đukić, 2010).

Porter and Kramer (2004), point out that CSR with direct impact on business also has an indirect impact on business through the mediation of the social community. Since there is a link between the economy and the community, the development of one positively affects the development of the other, and vice versa. An example of this is if companies help implement projects to improve the education systems in a particular community, this will contribute to improving the educational structure of the population, which ultimately has an impact on increasing the business performance of the company precisely thanks to a better offer of the qualification of the workforce.

Matten and Moon, (2004), point out that there are differences in CSR implementation and for that reason introduce explicit and implicit access to CSR. The explicit approach to CSR refers to corporate policy, programs and business strategies. However, Matten and Moon (2014) emphasize the managerial role in decision making regarding how to the business of the company will be organized in a socially acceptable manner.

The implicit approach to CSR implies the presence of certain institutions that give corporations a certain part of the obligations that are related to the interests of the company. By applying a large number of formal legal and ethical rules, these institutions force corporate managers to bear the responsibility for the influence of the company on all interest groups affected by the company's business. In most European countries, the emphasis is on the application of formal legal principles that are linked to the company's relationship with society (Matten and Moon, 2004).

In the reports of the European Union, attention is also directed to CSR. Thus, "Green paper", (2001), divided CSR into two dimensions: internal and external. According to the report, the internal dimension of CSR includes: investment in human resources, adaptation to applications, rational use of resources and energy. According to the report, the external dimension of CSR includes: local community development, enhancement of relations with stakeholders (business partners, customers, suppliers), respect for the human rights of all social groups with which the company operates and the environment in which the company operates.

On the other hand, "The International Organization for Standardization - ISO" has issued guidelines how companies and organizations can do business in a socially responsible manner. This means that businesses behave and operate in an ethically and transparently manner that contributes to the health and well-being of the society as a whole. There are seven core entities that ISO 26000: 2010 takes into account, namely: (1) corporate governance and

management, (2) human rights, (3) the environment, (4) fair business operations, (5) consumer care, (6) involvement and (7) local community development.

As we can observe upon all above-mentioned, there are a number of concepts related to CSR present in theory and thus in practice. The application of CSR concepts depends on the company's activity as well as on the characteristics of the country and the economy in which the company operates. Therefore, it makes sense to approach CSR in narrow specialized way in that sense, in this paper we limit our research to CSR in retail industry in a particular market (Croatia as an example from Central and Eastern Europe), and we are focusing on communication aspect of CSR.

3. Corporate Social Responsibility as a Research Topic in Retail Industry

Since CSR is applied in different businesses and different business segments, it also applies to the retail industry. Retailers should have a good knowledge of the environment and community in which they operate and they need to see on which ways they can contribute to the community and their environment.

Sciencia do Prado and Monforte Merlo (2011) point out that the retail sector is sector with great potential for applying CSR precisely because of its proximity to the end user, social affinity to the community, because it plays an important role in the value chain and broad geographical presence. Additionally, (according to Berman and Evans, 2007), buyers respond positively to retailers who are involved in activities such as establishment of shops adapted for people with disabilities, who provide support to charitable organizations and provide additional services to older people.

As stated by Deepa and Chitramani (2015), CSR requires that companies manage the economic, social and environmental impacts of their operations in order to maximize benefits and reduce the negative side for overall development. Retailers must pay attention to factors of store's image development as store image has a great psychological impact on the customer and can be wisely used to improve sales (Gupta and Pirsch, 2008).

Many factors have led to increased attention linked to the engagement of retailers in CSR, namely: sustainable development, globalization, governance, corporate sector influence, communication, finance, ethics, consistency and community, leadership and business tools.

According to Deepa and Chitramani (2015) Sustainable development is what every retailer should think about and sustainability needs to be implemented in business strategies. As an example, the use of resources can be highlighted. If they are exhausted unnecessarily and uncontrollably, their scarcity and even disappearance may come. In order to prevent such situations, it is necessary to think about sustainability and sustainable development in retail industry as a vital part of national economy (Stefanska and Škrobot, 2018).

The size of the company greatly affects the level of CSR, and thus the community and the environment in which the company operates (Hörisch, 2015). Even small and medium-sized retailers who jointly represent the largest employer have a significant impact. In general, companies are global ambassadors of change and value.

Progress and development of communication technology, such as the Internet and mobile phones, facilitates easy monitoring and discussion of corporate activities. Within companies,

this can facilitate management and reporting. Outside businesses, non-governmental organizations, media and other stakeholders can quickly assess and profile the business practices of companies they consider problematic or appropriate. In the context of CSR, modern communications technologies offer opportunities to enhance dialogue and partnership (Nielsen and Thomsen, 2009; Del Bosco, 2017), but also they force retailers to be more proactive and more transparent in communication with customers and other stakeholders.. About information flow and the way of communication inside and outside the company, i.e. from the company to the employees and from the company to the consumers, will be discussed more in continuation of this paper.

Retailers recognize that adopting an effective CSR approach can reduce the risk of business disturbances, open up new opportunities, boost innovation, enhance brand and corporate reputation, and even improve efficiency Deepa and Chitramani (2015) .

Smigielska and Oczkowska (2017) analysed situation in Poland according to CSR in retail industry. The case of Poland shows that as far as large, international retail companies are concerned, CSR applied on a voluntary basis is a myth. When the market was not saturated, and there were no strict statutory regulations, or institutions protecting consumers from unfair practices, and consumers were not educated, international retailers did not take care of them although, at the same time, they applied CSR in the host markets.

Renko et al., (2010) conducted research among managers and employees in Croatian retail companies. They explored the social responsibility from the aspect of responsibility according to community, employee responsibility, and environmental protection. Research has shown that Croatian retail companies understand the importance of the concept of social responsibility, but that they do not apply it in practice. In addition, the research had shown that most companies use the concept of CSR in communication with their customers, shareholders, and other stakeholders' groups, what is best seen in the content of their websites. However, as noted by Renko et al (2010) the concept of CSR in Croatian retail companies is widely used only as promotional tool.

4. Previous Research on Internet as CSR Communication Tool in Retail Industry

CSR changed over time and this concept became more and more represented in business practice, the CSR's communication as well as various activities related to this concept were altered. Today, the main way of communicating CSR is to point out the websites of companies where companies are publishing CSR reports and present the various CSR activities they are implementing.

Del Bosco, (2017) investigates how CSR communication has changed over the time on the company's website. The aim of analysis was to investigate the trends in CSR communication not only diversity of content related to CSR but the nature of information held on the Internet. Del Bosco's (2017) results show an increase in the use of the Internet for disclosing information regarding different CSR issues and an improvement in terms of kind of information disclosed and use of interactive tools.

Deepa and Chitraman (2015) and Jones et.al. (2007) studied the application of CSR in retail. Jones et al. (2007) conducted a qualitative research on a sample of ten leading retailers looking at the following CSR elements: environment, market (buyers and suppliers),

workplace (employees) and community. On the other hand, Deep and Chitraman (2015) studied the elements of communication by three retail companies in India and in all three cases they outlined the elements similar to Jones et al. (2007): environment, vendors, customers, communities, and employees. However, they identified some specific, additional elements of CSR communication such as development of young employees, education, reporting, etc.

Jones et al. (2007) have explored and analyzed the features and ways of CSR communication on the Internet for ten most successful global retailers. They point out that each retailer has his own specific approach to CSR implementation and that there are significant differences in the nature and scope of reporting on CSR. Authors focused on four CSR guidelines, namely: guidelines related to environment, market, workplace and community, as well as measuring successful CSR. The conclusion was that majority of most successful retailers point out that they integrate CSR into their business. However, there is no uniformity of reporting CSR on analyzed webpages. Even titles of segments of websites devoted to CSR are different. For example, at official websites of Tesco and Target devoted webpages and reports are referred as "Social Responsibility". In case of Metro, Carrefour and Ahold webpages and reports related to the CSR are called "Sustainability Report". Some retailers give a more limited access to information related to CSR activities, and on their webpages they merely give a brief description of the specific activities they have been implemented in CSR area.

5. Case Analysis of Corporate Social Responsibility Communication at Official Websites of Leading Retail Companies in Croatia

The Economics Institute of Zagreb (2018) lists ten leading retailers in Croatia. Ten leading companies in period 2014-2016 were namely: Konzum, Lidl Croatia, Plodine, Kaufland Croatia, Press, SPAR Croatia, Tommy, Dm-drogerie markt, Studenac and Pevec (see Table 1).

Table 1: Top ten retailers in Croatia, 2014-2016

Retailer	Sales revenue (in billions of kunas)	Sales profitability (in %)	Coefficient of total indebtedness	Liquidity coefficient	Average period of payment for obligations toward suppliers
KONZUM d.d.	10,2	-18,11	1,90	0,14	92,9
LIDL HRVATSKA d.o.o. k.d.	3,9	6,20	0,25	1,51	38,3
Plodine d.d.	3,4	2,21	0,86	0,42	87,3
Kaufland Hrvatska k.d.	3,3	-0,89	0,29	1,14	29,6
Tisak d.d.	2,6	-16,78	1,18	0,72	78,0
SPAR Hrvatska d.o.o.	2,3	-3,34	0,84	0,61	42,4
Tommy d.o.o.	2,3	4,83	0,72	0,54	52,3
dm-drogerie markt d.o.o.	1,6	4,35	0,40	2,01	26,6
Studenac d.o.o.	1,4	4,44	0,75	1,47	29,9
Pevec d.d.	1,3	0,95	0,47	1,50	55,0

Source: Economic Institute Zagreb, 2018

In this section of a paper, it will be analysed whether the leading Croatian retailers communicate CSR and activities related to CSR on their websites. The methodological approach is case study analysis based on research studies described in previous part of the paper.

Konzum on its website present a CSR as a special category, but only in Croatian language. Under this category, the three dimensions of CSR are particularly emphasized: environment, sponsorships and donations, and employee training. Consequently, the activities related to the CSR implemented by Konzum relate to its internal and external environment, i.e. to their stakeholders. On environment, they point out that they are the first retail chain in Croatia that has successfully certified the Environmental Management System according to the internationally accredited ISO 14001: 2004 standard. With this certification, they have only upgraded their policy and environmental management system. By introducing the above-mentioned certificate, they also emphasized their commitment to their partners, employees, customers and citizens. Concerning environmental concerns, it is still important to point out that Konzum is the largest buyer of packaging, which also greatly shows its environmental concern. In addition, in their stores they offered bags of 100% recycled materials and thus contribute to environmental protection (Konzum, 2019).

According to data on the official webpage, Konzum is also very active in the community concerning sponsorships and donations. They donate food, clothing, footwear, financial and educational assistance. Konzum encourages and helps the development of sports, with a

special emphasis on children. On their pages, special emphasis is given to the specific socially responsible activities they carry out. One of the activities is mentioned at their web site is "Vratimo djecu na igrališta" (in English: "Bring kids back to playgrounds"), within which Konzum has opened a total of 29 children's playgrounds in the last few years (Konzum, 2019). Each activity is well described and illustrated with pictures.

Concerning the education of its employees, Konzum has started the Konzum Academy. Konzum Academy is actually a centre for selection and education processes. Employees centre continuously refine business processes that take place in stores. If someone wants to become a Konzum employee, he is free to go to the Academy and pass the selection process so when the need for a job is met, they will call candidates from the base. This process is outlined in CSR devoted part of the website (Konzum, 2019).

Lidl Hrvatska highlights the CSR category within the official website in Croatian language. Within this category, there are five subcategories: (1) assortment, (2) employees, (3) environment, (4) society, and (5) business partners. The most explained CSR category is assortment. Within the assortment, they highlight thirteen subcategories of products, and for each subcategory they point out which socially responsible activities they are undertaking and how they have helped the community on the basis of these activities. The main idea is to harmonize social and environmental issues to justify customer confidence. Their motto is "On the road toward tomorrow". They point out that with assortment they act responsibly because they increase quality and assume their responsibility to human and nature. What they specifically undertake is consciously using of raw materials from sustainable development, advocating for transparent and credible product labelling and certification initiatives (Lidl Hrvatska, 2019).

Related to employees, they also point out that they are responsible for the fact that the good working environment is positively affecting the quality of the results and ensures their need for productive employees in the long run. On a daily basis, for their employees they create a positive working environment, focusing on personal and purpose-oriented cadre development, shaping decent working conditions, offering a flexible balance between private and business life. At the end, they emphasize that they advocate for diversity, dynamics and equality of opportunity (Lidl Hrvatska, 2019).

Related to environment, on their web site they pointed out that they are developing their locations, processes and technologies responsibly. Concrete activities in this area include: ensuring transparency in certification standards, efficient use of energy and resources, production and use of renewable energy sources, continuous improvement of the ecological component of the logistics and transport process, encouraging and active recycling wherever possible.

Concerning society as a CSR dimension, they emphasize that their size and appearance on the market can greatly affect society. They point out that they are working every day to implement social responsibility in society and the local community. Concrete activities they are undertaking are: immediate and purpose-oriented engagement on the spot, in the local community, and advocacy for an active and balanced lifestyle (Lidl Hrvatska, 2019).

In terms of business partners, they state that their quality standards lead to sustainable business relationships with their business partners. They are constantly working to maintain

long-term and partner business relationships with their business partners. The specific activities they are taking are: advocating for long-term and transparent quality standards, and providing support that includes improvements.

Based on the analysed web site, it can be concluded that Lidl devotes great attention to CSR. In detail has elaborated a large number of CSR dimensions and exactly elaborate how it has a positive impact on each dimension. They even highlight individual campaigns related to a particular dimension.

Plodine as a third of the leading Croatian retailers, does not have any of mentioned or featured CSR category at all. Likewise, they do not list their socially responsible activities anywhere on their web site. The only trace of social responsibility is what they say under its goals: "By following the positive retail trends and listening the needs and demands of the domestic buyer, we are always trying to develop our business through a responsible approach to business" (Plodine, 2019). Since there is no social responsibility on Plodine website at all, in this case there is a big space for CSR and CSR activities implementation in their business. There is also a need to highlight these activities on the official website.

Kaufland Hrvatska as the fourth of the top ten retailers on its web site does not specifically mention the CSR category, but lists the category "People and Environment", which includes some of the CSR dimensions as subcategories. Information is given in Croatian language. Specifically, it lists the following subcategories: sustainable assortment, environmental protection and climate, and social engagement (Kaufland Hrvatska, 2019). Kaufland points out that part of their corporate policy is taking responsibility for the environment. As a retail chain, special attention is paid to the sustainable selection of assortment. They advocate responsible production conditions, appropriate conditions for animal breeding and preservation of marine diversity. They pointed out details about products that contribute to the protection of humans, animals and the environment. Related to products, they refer numerous subcategories and their positive impact on humans and environment (Kaufland Hrvatska, 2019). Regarding to environmental protection and climate, they state that they are not only talking, but also working on that. In all areas of the company, consistent environmental and climate measures are being implemented. Their numerous activities come from the application of energy-efficient techniques and environmentally-conscious design of new buildings through logistic processes that are not harmful to the climate and to the avoidance of waste. On the website they explain in more detail all subcategories and influences. Under social engagement, they cite all their socially responsible activities and the projects that they have carried out and which they are continually implementing. They also point out that social responsibility is an important component of their business policy and their permanent commitment (Kaufland Hrvatska, 2019). Kaufland, similarly to Lidl, reports and informs all interested stakeholders about the CSR and all the activities they carry out related to CSR.

TISAK on its web site has a special category of Corporate Social Responsibility only in Croatian language. Their website states that they accept their social responsibility and base their business on organized management systems according to the principles of sustainable development. In their business, they want to have an effective and responsible attitude towards the environment, cultural and natural heritage (TISAK, 2019). Described social responsibility specifically refers to ecology, sponsorships and donations. In connection with

ecology, they point out eco-bags that they have put into business in order to encourage their customers to preserve the environment. Paper reusable bags are made from recycled and 100% non-polluting biodegradable materials (TISAK, 2019). In terms of sponsorships and donations, they donated mostly toys and money. On their web site, they indicate the NGOs and institutions they were donating. Regarding the Social Responsibility of TISAK, on their web site is a very brief description of their social responsible activities. Therefore, it is evident that there is space for improvement (TISAK, 2019).

Spar Hrvatska on its web site highlights the CSR category in Croatian language. There are no additional subcategories within this category, but only a brief description of socially responsible activities that Spar Hrvatska carries out or carried out. They point out several dimensions of CSR they pay attention in their business: employees, buyers, environment, ethical and legislative framework and donations (Spar Hrvatska, 2019). In addition, they emphasize that they pay special attention to their employees. They strive to ensure that their employees are doing the job adequate to their education, experience and preferences and that they are paid for their job adequately. Moreover, special attention is paid to their training and education. Employees are sent to seminars, educational programs or foreign language learning. New employees undergo complete training within the organization and get acquainted with other employees they will cooperate and with the way in which each department works (Spar Hrvatska, 2019). In relation to the customers, they emphasize that they want to exceed their expectations, especially with the price and quality of the product. Regarding to the environment, they describe that recycle all office waste and pay close attention to eco-packaging for which they received the award for the best eco-packaging at the CROPAK competition. While, regarding donations, it is pointed out that they are mostly oriented towards helping educational institutions and helping children with special needs. Additionally, website highlights the list of institutions they have been helping. Taking into account all that Spar Hrvatska has mentioned, it can be concluded that, as in the case of Tisak, the content is very concise and there is space for improvement in CSR communication with interested stakeholders (Spar Hrvatska, 2019).

Tommy as one of the ten leading Croatian retailers in the communication with its public on the website lists the category of Corporate Social Responsibility. It is provided in Croatian language. Within this website category, it is briefly state that they carry out and financially support numerous projects and humanitarian actions, thus helping to develop the community in which they operate, taking into account regional specificities and needs. They also state that they support big number of sporting events and clubs (Tommy, 2019). Based on the analysis of Tommy's website and the information available on it, it can be concluded that this retailer lists only one dimension of CSR, donations and sponsorships. In this case, there is a huge possibility for progress and investment in the remaining business segments, i.e. in other CSR dimension.

Dm-drogerie markt on its web site has the category "Corporate Responsibility" in Croatian language. Within this category large socially responsible projects that they implemented are described in detail. Described projects are directed to people and environment. The first mentioned subcategory is called "Jedni za druge" (in English: "One for others"), and within that subcategory are information on projects related to babies, women suffering from malignant diseases and the wider public (Dm-drogerie markt, 2019). The second subcategory is "Ekološka održivost" (in English: "Ecological sustainability"), within which they emphasize

that they want to be responsibly concerned with the environment. They are constantly addressing the theme of sustainable development and for this reason have launched a large number of environmental initiatives aimed at the protection of nature and the spread of a strong ecological message (Dm-drogerie markt, 2019). In addition, according to information given at their website that they have implemented projects with whom they wanted to encourage recycling among elementary school students. They also state that for several years in a row they have been implementing a project aimed at educating the people on sustainable development. They also point out a project through which their customers wanted to encourage recycling. The last subcategory mentioned on their web site is "Zdrav Život" (in English: "Healthy life"). Within this category, they describe activities that continually encourage projects related to the health of either children or adults (Dm-drogerie markt, 2019).

Based on the analysed content on the Dm-drogerie markt web site, it can be concluded that this retailer is paying attention to the CSR and that stand out mostly for two CSR dimensions. Namely, that are people (community) and environment. There are a large number of socially responsible projects they invest in. However, by comparing their way of communication with the way of communication of the rest analyzed retailers, content and communication could still be improved. The fact is that Dm-drogerie markt invests a lot of resources and efforts into CSR and socially responsible projects, but the communication of those activities regarding to remaining CSR dimensions is missing (dimensions such as employees, legislative regulations, products, etc.). But definitely would contribute to creating even more positive public image related to this retailer.

Analyzing **Studenac** web site, it can be concluded that this retailer does not even mention the CSR category as well as any socially responsible project. Thus, according to the information available on the web site, this retailer does not even conduct a CSR even in a small segment (Studenac, 2019).

Pevec does not mentioned the category CSR on its website, but there is a category "Sponsorships and Donations" in Croatian language. Within the category, the sponsorships and donations that they have donated are listed without any description or illustrative pictures provided. Contently and informatively, the category is very scarce. Other CSR dimensions are not mentioned at all so in this case there is also a huge space for improvement (Pevec, 2019).

To **summarize the findings**, two out of ten leading retailers in Croatia do not even mention the CSR category nor any of its dimensions or versions on their web site, that are namely Plodine and Studenac. The remaining eight retailers on their web site point out some version or some dimension of CSR (see Table 2).

As already discussed in Jones et al. (2007) we observe difference in approach to CSR in the way of naming the category on websites. Some retailers have the category of "Corporate Responsibility", some have the category "Social Responsibility", some have only the category "Donations and Sponsorships". In addition, some of the retailers within these categories have some subcategories, and some just describe the activities related to the CSR.

Table 2: Overview of CSR communication via web pages of ten leading retailers in Croatia

Name of retailer	CSR as a category on retailer official website	
	Presence of the category	Description of the category upon CSR dimensions mentioned in literature
Konzum d.d.	YES	The category is structured into subcategories according to analyzed literature.
Lidl Hrvatska d.o.o. k.d.	YES	The category is structured into subcategories, but it also emphasizes the range of assortment as an additional dimension of CSR. All CSR dimensions are elaborated.
Plodine d.d.	NO	The CSR category is not listed and does not give any views on any socially responsible activities anywhere on the web site
Kaufland Hrvatska k.d.	YES/Partially: Category "People and Environment"	The category is called "People and Environment" and contains three subcategories: a sustainable assortment, environmental and climate protection, and social engagement. They address all dimensions of CSR.
Tisak d.d.	YES	There are no subcategories on the web site, but only in the text give a brief description of socially responsible activities
SPAR Hrvatska d.o.o.	YES	There are no subcategories on the web site, but only in the text give a brief description of socially responsible activities
Tommy d.o.o.	YES	There are no subcategories on the web site, but only in the text give a brief description of socially responsible activities
Dm-drogerie markt d.o.o.	YES	The category is not structured according to the dimensions mentioned in the CSR literature, but is structured into subcategories according to projects: „Jedni za druge“ (refers to people and the environment), „Ekološka održivost“, „Zdrav život“ (refers to the health of children and adults). Some CSR dimensions are not addressed at all.
Studenac d.o.o.	NO	The CSR category is not listed and does not give any views on any socially responsible activities anywhere on the web site
Pevec d.d.	YES /Partially: Category "Donations and Sponsorships"	They do not state the category CSR, but only the category "Sponsorships and Donations" within which there are no subcategories but they only give an overview of the donations

Source: Author's own work based on websites content analysis of ten leading Croatian retailers'

According to the analyzed content, Konzum, Lidl and Kaufland present the various CSR activities and the most detailed information related to the CSR. They emphasize every

dimension of CSR that is given by previously analyzed literature (i.e. environmental, social, economic, internal and external stakeholder and voluntary dimension). For each dimension they give a detailed description of how they deal with it, how it is implemented in their business strategy and how they have helped to carry out responsible business through real activities.

The remaining five retailers at least in some form and a certain segment on their web site provide information about their socially responsible activities, i.e. how they conduct CSR operations in their company.

Particularly interesting is the fact that the Dm-drogerie markt invests a large amount of funds into socially responsible projects and activities, which is clearly visible from their website. However, the category of CSR on their website is not elaborated to the details and some dimensions are missing even though, they carry out activities in those dimensions. For instance, they are known on their internal responsibility for their employees (Rajcevic et al., 2012) and that dimension is not mentioned at the official website. Therefore, they could significantly improve CSR communication with their stakeholders at their official website.

6. Conclusions

As a strategic business concept, corporate social responsibility evolved over time. From Carrol's pyramide model and three-dimensional model described in some EU document towards the five dimension model quoted by many contemporary authors. The CSR dimensions given by contemporary literature sources are: (1) environmental, (2) social, (3) economic, (4) stakeholder and (5) voluntary dimension.

As a research topic, CSR is analyzed in various aspects. Due to specifics of doing business, widespread approach is research limitation to a particular industry and we found retail industry to be addressed by several research studies. Another approach is to pay attention towards some particular topic in CSR. One particular topic elaborated in a couple of research studies is way of communication of CSR policies on official web sites. In the paper both approaches are combined and the research based on case analysis method was carried on the sample of ten leading companies in Croatia as a part of Central and Eastern European region.

Eight out of ten leading retailers in Croatia communicate CSR policies and practices through their websites (at least some elements of CSR). Only two retailers do not claim to carry a CSR or any activity related to it. Majority of analyzed retailers describe specific projects and activities related to CSR and the most widely spread information on the websites are those on sponsorships and donations.

Out of those eight retailers which are pointing out on their web sites CSR category or some dimensions of CSR, three retailers are particularly distinguished by addressing extensively all relevant dimensions of CSR and providing accurate and up-to date data to their stakeholders. In other cases, there is a space for progress and improvement both in CSR application and in CSR communication.

We have to emphasize that our study has some limitations. Firstly, it is carried in qualitative way by case study method taking into account only information provided on official web sites of retail companies in Croatia. Better picture on CSR communication in retail companies could be obtained by adding analysis of information available in mass media and social media over

some period. Therefore, future research can be extended in this manner. Secondly, Croatia is only one out of dozen Central and Eastern European countries and the research results are limited to a small part of the region. In order to compare situation with other countries, we suggest further research in other CEE countries. Thirdly, the study is limited due to corporate perspective on CSR in given companies and objectivity of information given at their official websites. From this point of view, the problem should be addressed from customer or other stakeholder point of view as well. That would significantly contribute to knowledge on how customer or other stakeholder observe given CSR official web information regarding actual CSR practices of analyzed companies. Therefore, further research in term of customer survey can be developed to support this topic further.

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Research of gender-based behavioural differences in the purchasing decision-making process

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Abstract:

The goal of this paper is to explore changes in consumers behaviour which were caused by modern consumers trends with the accent on the gender-based differences in the behaviour by the purchasing process. Consumers behaviour in the purchasing process depends on a great number of factors, and one of them is certainly gender of consumer. Shopping habits and gender-based consumer attitudes are significantly different and have changed during past several years. With arrival of new technologies and by using modern marketing tools, these gender-based differences are remarkably changing. The habits of men and women during purchasing decision-making process have completely new characteristics now.

It is very difficult to gain consumers trust in time when they can easily access great amount of informations in every moment and producers have to put in a greater effort to please every modern and informed consumers needs. The aim of this paper is to analyse the considerable differences between women's shopping behaviour and men's shopping behaviour, to research their attitudes and habits by the purchasing decision-making process and to determine new shopping trends of these consumer categories. Using a structured survey questionnaire and customized CSI scale in this paper will be explored the key differences of gender-based consumers presenting themselves in the purchasing decision-making process as well as their habits and styles.

Keywords: consumer behaviour, gender-based differences, purchasing habits, trends, Bosnia and Herzegovina

This paper has been withdrawn at the request of the authors.

Competitiveness, Globalization and the Organizations

Community Management: Networking Approach as Business Model

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Abstract:

This paper elaborates on the concept of organizational networks and its management giving an overview of the subject matter. Leaning on the provided network theory, it introduces a pure network based business model on the case of European Network of Research and Innovation Centres and Hubs in Brazil (ENRICH). Initiated and funded by the European Commission the aim of the project is to establish a network of centres in the world's most promising, dynamic and innovative countries. The desired impacts encompass consolidated and increased cooperation between research, technology, and business organizations and individual researchers from Europe and partnering countries.

Keywords: Interorganizational networking, business model, network management, Brazil, EU

1 Introduction

In the era where economic growth is driven by innovation and innovation speed is accelerated by globalization and rapid technological advances, organizations face rising competitive pressure and increasing demand for more innovation. This created the necessity for organizations to climb up the value chain, seek for sustainable growth possibilities, and engage in non-stop adjustment and innovation processes. Many businesses hope to find the ultimate business model – a mode to establish a long-term foundation for success.

Just as business world evolved over the past centuries, so the entrepreneurs adjusted the business models accordingly. Business models saw several eras, one of which is relationship

era. This era is known more prominently for its brand relationship, where companies polarized stories around the brand that would become a part of customers' identity. The most recent version of this business model is the intimate, personal relationship with customers that enables the savvy entrepreneurs to communicate directly with its customers and consequently meet their demand. This allows the companies to build a long-term relationship with its customers and secure profits. However, a further facet of business models that encompasses relationships had and still has an essential role in the race of business survival. The interorganizational relationship has been the foci in various studies that deals with organizational strategies (Miles and Snow 1986; Astley and Fomburn 1983; Astley 1984; Ring and Van de Ven 1994; Ansoff 1968; Freeman 2010). The notion of interorganizational networking emerged along with technological advancements and development of novel corporate strategies (Park 1996), yet its economic benefits were recognized already in the time of Adam Smith. Although he did not specifically use the term "networking effects", Smith (1776) appreciated the benefits of business networking as the basis for labour division in agricultural and industrial society (Österle et al. 2000; Ng et al. 2003). Dasgupta and David (2007) described social networking in scientific and technological landscape as the new economics of science.

Before organizations could see the benefits of networking, scholars considered interorganizational relationships as competitive and antagonistic (Astley 1984). Astley (1983) states that traditional business theories used to regard the environment (including other organizations) of an organization as exogenous. This implies that an organization has no control and a capacity to affect its surroundings but to adjust itself. The freedom of managerial choices is neglected and organizational strategic actions are defined as an internal capacity that adapts to the given exogenous environment. As Astley continues, this myopic point of view disregarded the effect of communal arrangements that organizations create while seeking for solutions. Therefore, organizations were viewed as completely independent units with competitive strategy based on independent actions that were taken to serve the opportunistic choices.

Beginning 1980s, organizations have begun to connect and collaborate within and across sectors and disciplines more intensely letting us witness what are variously called interorganizational relations, workforce development networks, alliances, collaborations, partnerships, coalitions, joint ventures, franchises or research consortia (Mattessisch and Monsey 1992; Ring and Van de Ven 1994; Ebers 1997; Galaskiewicz 1998; Pynenburg 2000; Ferguson and Dickens 1999; Cordero-Guzman 2004). According to Ebers (1997), during this time the within industry connectivity among high-technology organizations (e.g. biotechnology, hospital systems software, automobile) increased significantly. On the other hand, some other industries, such as US construction, US film, Italian textile and clothing, German metal, or Japanese and Korean conglomerations, i.e. Keiretsu and Chaebol, represent long-standing cooperative organizations.

While the significance of interorganizational networking effects and the reasons of network formation have been profoundly investigated (e.g. Håkansson and Snehota 1989; Nohria and Eccles 1992; Alter and Hage 1993; Mizuchi and Galaskiewicz 1993; Grandori and Soda 1995; Ebers 1997; Powell 2003; Smith-Doerr and Powell 2005; Burt 2009; Axelsson and Easton 2016), the theoretical framework for interorganizational network management lacks in the literature. The coordination process of multiple players of the network is a complex task due

to the inherent egocentricity and coherent pursuit of individual goals by partners (Kogut 1988 and Parkhe 1993). Furthermore, interfirm collaboration of any form seems to be commonly perceived and implemented as a component of business strategy and tactics. Taken as an element of the business strategy, it contributes towards the realization and adaptation of the core business model in a constantly changing market and customer requirements. It is utilized as one of numerous tools for business growth and problem solution.

This paper, on the other hand, presents a pure network-based business model on the case of the European Network of Research and Innovation Centres and Hubs (ENRICH) in Brazil. The business model is based on an agile networking concept that factors in openness, flexibility, remoteness; simultaneously it fosters business growth of the network partners and further expansion of the ENRICH networking landscape. Hence, ENRICH is responsible for the coordination and management of the network players and the interaction process among them. Initiated and funded by the European Commission the aim of the ENRICH project is to establish a network of centres in the world's most promising, dynamic and innovative countries. The desired impacts encompass consolidated and increased cooperation between research, technology, and business organizations and individual researchers from Europe and partnering countries. We propose that this model can be implemented by both profit seeking and non-profit organizations. As of ENRICH in Brazil, it is a non-profit organization that is expected to become financially self-sustainable after the initial funding period.

The structure of this paper is as follows. Section 2 describes the definition and demarcation of the term "interorganizational networking". Furthermore, it sheds light on the benefits of networking and reasons why organizations practice it. Section 3 defines the network management in and its difficulties. Section 4 elaborates the management methodology of the ENRICH in Brazil's network. Finally, Section 5 provides concluding remarks.

2 Definition and demarcation of networking

The term "network" is used in various disciplines including economics, information technology, sociology, etc. Depending on the context its definition and usage vary across and within disciplines. In the following, this paper will refer to networking in the realm of organizational theory. Therefore, prior elaborating on organizational networks, it is necessary to define what an organization is. Below are three main characteristics that make a random entity to an organization. Every organization:

- 1) has a purpose that is continuously pursued yet is not necessarily in line with individuals' goals
- 2) consists of individuals who are responsible for accomplishing tasks that are assigned according to certain rules and aspects and
- 3) has a boundary that allows the differentiation between organizational inner and outer environment (Kieser and Walgenbach 2010 and Holtfort 2013).

The notion of network is described by Fombrun (1982) as a set of reappearing bonds (e.g. information and knowledge ties, friendship, resource) within various nodes (e.g. individuals, groups, organization, community, nation-state). He distinguishes between attribute and transactional networks. The former connects various nodes that have common characteristics (e.g. objectives, characteristic attributes, gender, status, etc.) and the latter focuses on

exchanges among a set of nodes. Network is a complex phenomenon that has three different relational levels: interpersonal, interunit and interorganizational (Kilduff and Tsai 2003 and Brass et al. 2004). The interpersonal network is established between individuals, whereas the interunit or intraorganizational networks are found within formal organizational boundaries (e.g. working groups or departments). When relationships are developed between independent organizations it is referred as interorganizational network (Phelps et al. 2012), which is the foci of this paper.

The literature provides many definitions of interorganizational networks. At the core of all of them, this phenomenon is conceptualized as a relationship structure that is developed between different organizations (Popp et al. 2014). It is widely practiced in the economic and business sectors, public administration and nonprofit organizations (NGO), as it has long been recognized to be one of the key factors to success (Håkansson and Snehota 1989). However, these and other forms of organizations practice different types of networking, as network types are manifold. Depending on the purpose (strategic networks), content of the transaction (production or distribution networks), management (hierarchical or heterarchical) and durability (stable or dynamic), the interorganizational networks are further typologized (Liebhart 2002; Jansen 2006; Petry 2006; Sydow 2010). In the literature a frequently mentioned typologization differentiates between strategic, operative, regional and virtual networks, though it cannot be guaranteed that it does not overlap with other typologizations not mentioned in this paper. From various largely overlapping compilations of typologizations, Sydow's (2010) provides a sound overview (**Table 1**). Leaning on Sydow, an analysis matrix was developed that in combination with other formal analysis and acquisition methods of networking partners contributes to the implication of the ENRICH in Brazil's business model. The matrix is depicted in section 4.

Table 1: Typologization of interorganizational networks (Sydow 2010, p. 380)

Interorganizational network category	Features
Industrial networks – service sector networks	Sectoral affiliation of enterprises
Firm networks – NGO networks	Business networks – non-business networks; mixed in "Public-private Partnerships"
Intracorporate – corporate-wide networks	Corporate affiliation of most companies
Strategic – regional networks	Governance form and further features [...], strategic networks – small firm networks
Local – global networks	Spatial sprawl of networks
Simple – complex networks	Number of network actors, network density, degree of complexity of network relationships
Vertical – horizontal networks	Position the enterprises in the value chain
Mandatory – promotional networks	Exchange of services or enforcement of mutual interests as the network purpose
Legal – illegal networks	Violation and infringement of existing law or regulations (e.g. cartels)
Voluntary – prescribed networks	Collaboration and cooperation between enterprises prescribed by law
Steady – dynamic networks	Stability of membership and network actors
Market networks – organizational networks	Dominance of coordination mode
Interorganizational network category	Features

Hierarchical – heterarchical networks	Management form based on governance form
Internally – externally governed networks	Governance form based on the location (e.g. by third parties or network management organizations)
Central – decentral networks	Degree of polycentricity
Bureaucratic – clan-like networks	Form of the organizational integration of network enterprises
Exchange – stakeholder networks	Reasons of network membership
Explorative – exploitative networks	Dominant network purpose
Social – economic networks (similar to: expressive – instrumental, identity-based – calculative networks)	Network membership has a dominant purpose
Primary – secondary networks	Relevance from the perspective of the focal enterprise
Formal – informal networks	Formality or visibility of networks
Open – closed networks	Entry and exit option
Planned – emergent networks	Formation art
Innovation networks – Routine networks	Degree of innovation as network purpose
Customer – producer guided networks	"Location" of the strategic governance
Procurement, production, marketing and logistic networks	Operational functions that are accomplished in network cooperation

Besides above typologization, networks can be distinguished into two groups by the existence of proactive network management procedures: intentional (organized) and emergent (unorganized) networks (Rampersad et al. 2010). Emergent networks are referred as "network of organizations" and are more challenging to manage. In contrast, intentional networks are denominated as "network-organizations", and hence, are perceived to be relatively more manageable (Ritter et al. 2004; Heikkinen et al. 2007; Parolini 1999; Achrol and Kotler 1999). The details of unorganized networks is beyond the scope of this paper, thus, the following handles the management of organized networks a.k.a. network-organizations.

During the rapid evolvement of network theory (ca. 1970-2000), the growing literature on the topic provided diverse definitions of network-organization. Achrol and Kotler (1999), describe it from the marketing perspective as "... an independent coalition of task- or skill-specialized ... autonomous organizational units that operate without hierarchical control but is embedded, by dense lateral connections, mutuality, and reciprocity, in a shared value system that defines ... membership... roles and responsibilities". This definition is complemented by Weyer's (2000) by pointing out that network-organization is a system of constructs comprised from strategically acting players that coordinate their actions depending on the expected benefits. Furthermore, network-organization is a purposeful, conscious (Miles and Snow 1986 and Jarillo 1988), organized (Rampersad et al. 2010) and formal (Moretti 2017) network and is defined by the following two characteristics (Glückler 2012 and Sydow and Duschek 2013):

- 1) Identity – the minimum degree of delineation and consensus with regards to who belongs to the network and who to the exogenous environment
- 2) Governance – certain degree of network-wide coordination and controlling.

Based on the ENRICH in Brazil's business model, this paper adapts the above combination for the definition of the network-organization.

Having defined what network-organization is, the subsequent question is why organizations intentionally establish such networks? Since networks are created to pursue a clear set of objectives and as Weyer (2010) stated that network players act in certain manner expecting certain benefits, below is a list that gives a compact overview of possible network objectives (Morshett 2003; Lipperini and Sobero 1994; Pittaway et al. 2004; Brass et al. 2004; Rickne 2006; Powell et al. 1996; Galaskiewicz 1985; Alvarez and Barney 2001; Shane and Cable 2002; Le and Nguyen 2009; Lechner and Dowling 2003) and resulting benefits (Table 2). The list may not cover the entire spectrum of objectives, but provides common reasons of forming or joining a network.

- Economies of scale
- Transaction costs
- Knowledge creation, attainment and spillover
- Access to infrastructure (technology/labs), markets/reduction of market entry barrier, necessary skills and expertise, funds and financial resources
- Performance and efficiency
- Increased capacity for innovation
- Increased probability of survival
- Resource procurement and pooling
- Decreased probability of risk and uncertainty level
- Increased influence on competition through joint enforcement of standards
- Circumvention of barriers to trade through international partners/partners in the host countries
- Increased flexibility
- Decreased time costs
- Increased trust

Table 2: Potential benefits of interorganizational networks (Popp et al. 2014)

Potential benefit	Description
Access to and leveraging of resources	<ul style="list-style-type: none"> ▪ Stretch, build on or strengthen limited resources ▪ Access to resources not held within a particular organization (Bryson et al. 2006; Gulati et al. 2011; Huxham and Vangen 2005; Milward and Provan 2006; Provan and Lemaire 2012; Scott and Hofmeyer 2007; Weber and Khademian 2008)
Shared risk	<ul style="list-style-type: none"> ▪ The ability to distribute or share risks fosters creativity and innovation by reducing risk to any one organization (Casebeer et al. 2009; Hoberecht et al. 2011; Huxham and Vangen 2005; Kapucu and Demiroz 2011; Weber and Khademian 2008)
Efficiency	<ul style="list-style-type: none"> ▪ More efficient use of resources• Ability to achieve economies of scale (e.g., purchasing, being more competitive in grant competitions) (Huxham and Vangen 2005; Provan and Kenis 2008; Provan and Lemaire 2012)
Service quality, coordination, seamlessness	<ul style="list-style-type: none"> ▪ Ability to provide coordinated, higher quality services and a full continuum of care (Hoberecht et al. 2011; Huxham and Vangen 2005; Kenis and Provan 2009; Popp et al. 2005; Provan and Lemaire 2012)
Advocacy	<ul style="list-style-type: none"> ▪ Able to exert more pressure due to greater political clout and community reach resulting from greater numbers and diversity of network members (Provan and Lemaire 2012)
Learning, capacity building	<ul style="list-style-type: none"> ▪ Knowledge exchange can enable learning and capacity building at a network level and in the broader community (Brass et al. 2004; Bryson et al. 2006; Huxham and Vangen 2005; Isett et al. 2011; Keast et al. 2004; Kenis and Provan 2009; Klijn et al. 2010; Knight 2002; Knight and Pye 2005; Provan and Lemaire 2012; Weber and Khademian 2008)

Positive deviance	<ul style="list-style-type: none"> ▪ Networks can be a forum to think and act beyond the organizational norm, structure or mandate; to work deliberately in deviation from the standard organizational processes, overtly or covertly, to influence change in systems (Casebeer et al. 2009)
Innovation	<ul style="list-style-type: none"> ▪ Networks are enabling structures that create opportunities for innovation, which is closely connected to learning (Brass et al. 2004; Hoberecht et al. 2011; Klijn et al. 2010; Provan and Lemaire 2012)
Shared accountability	<ul style="list-style-type: none"> ▪ Opportunity to work collaboratively to address, and share responsibility for, a quadruple bottom line (e.g., financial, social, environmental and cultural) ▪ Developing a sense of accountability to one's network colleagues (Hoberecht et al. 2011; Romzek et al. 2012)
Flexibility and responsiveness	<ul style="list-style-type: none"> ▪ Capacity to be more flexible and responsive in order to deal with unforeseen problems (e.g., disasters) (Isett et al. 2011; Provan and Lemaire 2012)

An organization's long-term success depends on the ability to exploit current capabilities and simultaneously explore new opportunities (Levinthal and March 1993, March 1991 as cited in Raisch et al. 2009). For ENRICH in Brazil, from the organizational point of view, the utility generated through exploitation is essential, as such benefits would contribute to its objective of becoming financially self-sufficient. On the other hand, considering ENRICH in Brazil's mission and vision, the ultimate aim of which is innovation boost and economic growth, exploration would pave the path to the long-term benefits. In this sense, ENRICH in Brazil is an ambidextrous organization, that simultaneously exploits and explores. Moreover, it aims to establish a large interorganizational network that is not only based on the market price mechanism or hierarchical relationship, but is a hybrid of both. This form of interorganizational networks requires a different management method than management of a single organization. Next chapter on network management further elaborates the management of hybrid networks but also provides detailed information on network management.

3 Networking management

The definition of the network-organizations provided in the previous section suggests that it has structural (network players are linked with each other) as well as behavioral (network players interact with each other) dimensions. And according to Riemer and Klein 2006 and Mirzadeh et al. 2012, these dimensions need management and controlling. Literature on management of network-organizations is dearth and does not provide a uniform definition of network management. Therefore, the definition that will be adopted by this paper will be provided in section 4. For ENRICH in Brazil networking is the core of its business model, and hence the management of its partners requires a slightly different method compared to the theoretical approach discussed in this section. Kaczmarek et al. (2004) suggest that network management can be characterized via description of network objectives and areas of responsibility. As an example the following definitions are provided:

- Network management comprises establishment and development of network structures and network relationships as well as their coordination with regards to network objectives.

It includes all the tasks required to shape the cooperation of the members throughout their joint cycle of cooperation (Beck 1998)

- Network management (in a functional sense) refers to the cooperation-wide design and coordination of all interdepartmental relationships of dependence in factual, temporal and social dimensions that are maintained in order to achieve the common purpose of cooperation (Wohlgemuth 2002).

Accordingly, network management is conceptualized as a combination of tasks, which prior to the beginning of cooperation and during the network activity must be executed. The first step of the network management is the construction of network structure and inter-organizational relations. This requires selection of suitable network partners, appropriate locations and most importantly the network form. The network infrastructure must be designed in organizational and technical as well as personal terms. Furthermore, the structures and processes in the network must be planned and defined in beforehand. After the network configuration, processes and activities must be managed and controlled during network operation. An essential aspect is the maintenance and preservation of the network structure, the relationships in the network and their synergistic coordination (Strohhecker and Größler 2009).

As Strohhecker and Größler (2009), the first step of managing a network involves, inter alia, selection of the network forms. These forms are manifold, whereby cooperation, collaboration and coalition are most commonly used terms, which are often used interchangeably. To differentiate them from each other, Frey et al. (2006) provided a matrix depicting the five levels of partnership (Table 3).

Table 3: Five levels of partnership (Frey et al. 2006)

	Communication	Cooperation	Coordination	Coalition	Collaboration
Information parts	Mutual awareness of the existence of other organizations	Mutual provision of information	Parts of information	Parts of ideas	Members belong to a system
Roles/resources	Loosely defined roles	Defined roles in some form	Defines roles, parts of resources	Shared resources	
Communication	Little	Formal	Regular	Regular and prioritized	Regular and are characterized by trust
Decision making	Independent decision making	Independent decision making	Partially mutual decision making	All member have the right in decision making	Consensus of all members with regards to decision making

As Table 3 shows, collaboration is the highest level of partnership. To create such a partnership environment potential network players need to avoid culture clashes and loss of autonomy, decrease coordination fatigue, calculate time and effort required in developing trusting relationships and mitigate power imbalances (Popp et al. 2014).

Having selected a particular network form, an essential step for interorganizational networks is to decide on the structure of network governance. Provan and Kenis (2008) and Milward and Provan (2006) propose three types: shared governance, lead organization and network administration organization. Yet, sometimes network governance also takes a hybrid structure combining every three governance types (Lemaire et al. 2010 and Provan and Lemaire 2012). To maximize the effectiveness of a particular governance model, networks need to consider the network size, existence of consensus, degree of trust and whether there is a need for network level competences (e.g. building legitimacy, advocating, bridging, quality monitoring, negotiation, etc.) (Milward and Provan 2006; Provan and Kenis 2008). **Error! Reference source not found.** shows the key predictors of a good between a network and governance structure.

Table 4: Key predictors of a good fit between a network and a governance structure (adapted from Popp. et al 2014)

Governance structure	Distribution of trust	Number of members	Consensus	Need for network level competences	Decision making
Shared governance	widely distributed	few (<5-8)	high	low	decentralized
Lead organization	narrowly distributed, occurring differentially within individual dyads or cliques	moderate number	moderately low	moderate	centralized
Network administrative organization	Moderately distributed, NAO monitored by members	moderate to many	moderately high	high	mixed

Network management is a difficult task and the costs of network disruption are significant (Buckley and Casson 1988 and Kogut 1989). First, if the network players perceive rivalry among themselves, trust attenuates and opportunism is instigated. From the traditional transaction-cost economics, networks may fail due to opportunistic behavior of network parties who seek to accomplish their individual goals (issues of market mechanism), and costs that incur through bureaucracy (issues of hierarchical system) during the coordination process of goods and services' exchange (Park 1996).

Milward and Provan (2006) suggest network managers to observe exogenous and endogenous changes of the network during its life-cycle and choose the right governance models for the particular time, because the governance structure evolves over time in other words it has to be dynamically flexible in order to adjust to the inner and outer changes of the network. By adjusting the model in accordance to the life-cycle and network surrounding will aid the long-term survival.

4 ENRICH in Brazil's network management

ENRICH in Brazil constitutes from network of actors interested in either benefitting from or providing services in support to European (Brazilian) research and innovation players that aim at tapping into Brazilian (European) markets. Comprising various stakeholders such as companies, universities, research and innovation organizations, funding agencies and non-profit organizations, this network-based community acts under the umbrella of ENRICH in Brazil which has a mission of encouraging and facilitating cooperation in research, technology and entrepreneurship between Europe and Brazil by supporting and empowering all innovation actors (public & private) along the innovation (value) chain. It's objectives are:

- to promote excellence in business, research, and innovation (B&R&I)
- to create a win-win situation for Brazilian and Europeans in the area of science, technology, and innovation
- to connect European researchers & entrepreneurs in the Brazilian market
- to connect Brazilian researchers & entrepreneurs in the European market
- to offer services to Brazilian and European clients
- to integrate existing European and Brazilian initiatives, projects, and networks

As discussed earlier, organizational networks have various meanings and definitions depending on in which area it is used and for what purposes. Even in the Neolithic period, the network concept existed in the form of a network of cultural interactions, commodity exchanges or network of campsites (Ibáñez, 2015). In this paper, we refer to organizational networks from a business perspective as a network of professional relationships that have a potential to contribute to organizations growth and prosperity.

Accordingly, the business model of ENRICH in Brazil is based on an agile networking concept, which enables involved parties to join the network but also allows them to detach from it when necessary without highly bureaucratic processes. A network-based business model is a business model that comprises several stakeholders who create a joint value proposition based on the available resources and key activities of all stakeholders (Lund and Nielsen 2012). The special aspect of such a business model is that stakeholders are not bound to interact in a traditional value chain manner (Lazzarini et al., 2001) but are free to perform in any direction be it downstream or upstream as long as it drives the value added of the network. As partners can also influence value creation, networking is seen as a competitive advantage.

Every network-based business model has a focal organization at its core (Zott and Amit, 2009), which is ENRICH in Brazil's headquarters combined with its branch offices. The individual contribution of each member of the network need to align with their own existing business portfolio yet not compete with their existing markets (Lund and Nielson, 2014). Thus, transparent communication with potential community members about mutual benefits is set to be the key to the continuous development of ENRICH network. In order to identify and map mutual benefits and develop a business model that involves mass-cooperation, we utilize the Business Model Canvas developed by Osterwald and Pihneur whilst extending it by independent canvases of ENRICH in Brazil's community members. To establish and foremost to make assumptions about the detailed business model of each potential networking partner, especially private companies, is a time-consuming and inefficient process. Therefore, a general canvas for each community member group will serve as a ready-to-use sample-model (e.g. universities, NGOs, profit seeking private firms, individuals, etc.). When aiming at

acquiring a new networking partner or upon receiving a letter of interest, ENRICH can assign it to a certain member group hence identify the mutual benefits.

The networking based business model of ENRICH in Brazil applied successfully is expected to lead to a medium-term financial sustainability of ENRICH in Brazil's Headquarters and its regional branches but also contribute to the profit generation, growth and visibility of the affiliated organizations and individuals (networking partners). The expected impacts of ENRICH in Brazil's activities and performance are the following:

- reinforced cooperation and collaboration between European and Brazilian science, technology and innovation (STI) actors
- higher visibility and prestige for European (Brazilian) STI actors in Brazil (Europe)
- Stronger presence of European (Brazilian) private and public organizations as well as individuals in the STI environment of Brazil (Europe)
- Improvements of the framework conditions for international cooperation in STI field in both regions
- Enhanced impact of results from research and innovation projects, such as Horizon 2020, through increased access to excellence and markets of Brazil (Europe)

The proposed business model will allow ENRICH in Brazil to acquire key private and public networking partners with distinct backgrounds in an ad-hoc style. Meaning, the networking is performed in an agile form. When ENRICH in Brazil requires certain resources and knowledge/capabilities, suitable networking partners will be pursued and attached to the business for a duration of services to be offered / project. Partners of ENRICH in Brazil, on the other hand, will benefit from the wide network landscape of the ENRICH community and have the opportunity to expand their business and R&D&I activities to the partnering countries. Depending on the market sector or research discipline, network partners will have access to the local infrastructure, support along the entire value chain. Some market partnerships may also support in the market entry process. The model concentrates on the creation and consolidation of connections and networks allowing businesses to burgeon based on these networks.

The model alleviates the burden of having all resources that go beyond what is necessary for a smooth business operation (beyond domestic, in the beginning phase of internationalization and later on as well). Its agile characteristics that allow organizations to cooperate for a specific purpose for a short time but repeatedly over a long-term has the benefit of eliminating the rigid contractual conditions. Furthermore, it can be adopted by other organizations, as many are forced to become financially self-sufficient by the end of their initial funding.

For the network management, ENRICH in Brazil adopted a network analysis matrix proposed Helfert (2009) (Table 5). This method enables ENRICH to have an overview of all (potential) network partners, their objectives and benefits from joining the ENRICH network community. It supports decision making concerning the future partnerships but also the development of existing partnerships.

Table 5: Network Analysis Matrix of ENRICH in Brazil (adapted from Helfert 2009)

General network description	
Legal	
Criteria	Comments/questions
Legal form	Depending on the purpose e.g. Ltd, plc, registered association, etc.
Contractual form	Is the partnership based on legal agreements? Which? e.g. Letter of Intent, Cooperation Framework Agreement, Development Agreement, Partner Program Agreements, Distribution Partner Agreement, Participation and Corporate Contract, etc.
Date of foundation	Since when does the network exist?
Timeframe	Short, medium or long term; temporary or permanent
Liability	Regulation of liability issues
Composition, type and network orientation	
Criteria	Comments/questions
Number, type and size of members	Actors who are directly involved in the network. How many members does the network have? What kind of primary actors are involved, e.g. Research and educational institutions, associations, trade unions, NGOs, private companies. How large are these network members?
Represented sectors / fields of activity	In which sectors / fields of activity are the primary players active?
Geographical distribution of members	Local, regional, national, international
Target group penetration	What is the percentage of network members in the group of eligible organizations / individuals? (For example, regional industry networks: what percentage of the industry's industry in the region is a member of the network?)
Network orientation	Economic /market / social wealth/both/at the interface between the market and the common good
Hierarchy structure	Is there a higher-level committee that coordinates the network (hierarchical structure) or is the coordination and cooperation between the network actors decentralized (heterarchical structure)?
Degree of integration of members in the network	1. Interest group with exchange of experiences / learning processes / knowledge exchange 2. Cooperative design through task and function coordination / assignment 3. Planning / realization and optimization of common value creation processes 4. Integration of all service creation processes and joint market presence 5. Joint venture / organization
Control and relationship logic / form of cooperation / value added structure	Multi-sectorality: -Horizontal (at the same level of production / knowledge level) -Vertical (different levels of production / knowledge levels) -Diagonal (mixed form, cross-sector / cross-industry as appropriate) Do network members have the same or complementary content? Are there dependency relationships between the cooperation partners?
Development of the network/partnership	The network is growing-shrinking –stagnating (further growth desired) -consolidated (no further growth desired)
Content range	Project-related Orientation to a business / action / action field Focusing on several business / action / action fields
Network tasks	
Criteria	Comments/questions
Founding motivation	E.g. economic motives (securing market positions, saving resources, costs and time, minimizing risk, faster and more cost-effective development and / or production, faster and wider market introduction, strengthening competitiveness, quality

	improvement), or social / innovative motives (knowledge transfer, common learning processes, etc.)
Goals and motives of cooperation	E.g. economic motives (securing market positions, saving resources, costs and time, minimizing risk, faster and more cost-effective development and / or production, faster and wider market introduction, strengthening competitiveness, quality improvement), or social / innovative motives (knowledge transfer, shared learning processes etc.) Are there plans for future development?
Target group / customer	Who is the target audience / customer for the activities of the network? For whom does the network mainly provide its services? -> Members (internal) / Environment (external)
Network controlling	
Criteria	Comments/questions
Control instruments / network management	E.g. Committee and instruments for cooperation, equality of interests, conflict prevention, management of interfaces between actors; Network management system
Success	How is success in the network defined?
Success factors (drivers and obstacles)	What are success and failure factors? How are they identified? Do these result from the network value or actors from it or from external (eg social) framework conditions?
Impact monitoring / controlling	Are there specific procedures for measuring success / controlling? How is success tested? Is success measured continuously?
Collaboration and roles in the network	
Criteria	Comments/questions
Competence profiles of the actors	What competences do the network actors have? Are these competencies the same or complementary? Where do they overlap?
Cooperation, competition and power	Will the cooperation goal be overlaid by other goals? Are there any other elements of network member interaction besides? e.g., competition (network members compete with one another, e.g., as a supplier to a focal enterprise) - exercise of large, dominant members
Roles in the network	Does the type of cooperation result in certain roles of individual members in the network, e.g. (network-internal) suppliers and customers, customers and service providers?
Processes	Are there recurring processes in the network? (e.g. in the form of value chains or recurring events such as awards)
Implementation of functions and activities	Are activities separated from the actors or carried out together?
Costs, resources and risks	
Criteria	Comments/questions
Financing Scope / form of participation	Distribution of costs Financial contribution of the actors
Resources	Contributed resources (e.g., organizational), complementarity
Risks	What are the risks associated with participation (for example, image damage, loss of power)?
Network Environment	
Criteria	Comments/questions
Secondary actors	Competitors, trade unions, legislators, media and other actors who are not directly involved in the Alliance but who can influence their activities.
Other networks	To which other networks does the examined network cultivate contacts or cooperations? (e.g. sharing experiences, lobbying, benchmarking ...)? Which comparable networks does the network compete with?

Conclusion

The main aim of this paper was to elaborate the concept of organizational networks and their management from the theoretical point of view. Furthermore, the paper aimed to introduce the business model of ENRICH in Brazil in accordance of interorganizational networking theory. Although interorganizational networking has been extensively researched, there is very few case studies and literature on the business model that is based on networking. The business model introduced in this paper concentrates on the creation and consolidation of connections and networks allowing businesses to burgeon based on these networks. By deploying or leaning on the proposed model, organizations have a possibility to expand globally at an exhilarated speed with relatively less initial investments assuming the network has strong ties and has the necessary resources. Especially at times of increased protectionism that makes harder for private firms to compete in the world's most promising emerging markets, the model offers a way out of the stalemate and find an opportunity to do business in the changing global economy. The model does not exclude and hence let itself extend by digital solutions. This business modeling approach could be implemented by government institutions attempting to establish cross-country organizations. The contribution of this paper helps to position various potential networking partners around a business model such that it becomes the core business of the organization and generates additional value to the members of the entire network.

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Foreign Ownership and Performance: The Case of Portuguese Industrial Firms

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Abstract:

The objective of this paper is to empirically examine the relationship between the firms' ownership and control structure, in particular the presence of foreign capital, and its financial performance. The literature about performance determinants is abundant, however, the relation between performance and ownership and control structure is much less studied. The performance of the Portuguese economy is still highly dependent of foreign investment inflows directed to the industrial sector, a sector mainly comprised of SMEs that are responsible for the majority of job creation, innovation and exports. This paper uses a balanced panel data of 5.722 firms for the period from 2010 to 2017, researching if the presence of foreign capital influences financial and economical performance, and controlling the effects of other variables such as size, age, exports, indebtedness and sector of activity. Finally, possible non-linear effects or moderating and interaction roles between variables are also tested. Our results evidence that, despite foreign firms higher levels of profitability, the degree of foreign ownership and institutional difference generally showed a non-significant relation with performance. Nevertheless, there seems to exist a non-linear relation between the development level of the country of origin of the share capital and profitability, with the results indicating that firms with share capital originated from more advanced countries attain a higher performance.

Keywords: Ownership structure; Financial performance; Foreign investment; SMEs; Industrial sector

1 Introduction

The increase in international capital flows over the last decades motivated the research about the potential impacts of those flows on firm performance (Gomes and Ramaswamy, 1999; Kotabe et al., 2002). Due to the significance of Foreign Direct Investment (FDI) among the other sources of international flows, this paper follows that micro perspective focusing on Small and Medium Enterprises (SMEs), rather than the usual macro perspective adopted when studying the impacts of FDI on economic growth.

Joint-ventures (JVs) and wholly foreign-owned firms coexist in Portugal, rendering particularly relevant an analysis of the influence of different degrees of foreign ownership on firm performance. Wholly-owned firms are subsidiaries of a parent firm from another nation,

which has full ownership and sole responsibility for the management of the operation. On the other hand, JVs involve a local and or a foreign partner that share the ownership, management, risks and rewards of the newly formed entity. According to INE (2018), there are 6.455 foreign subsidiaries operating in Portugal (1,6% of all non-financial firms), a number reflecting the country's peripheral nature. The majority of firms are owned by intra-EU firms, are classified as SMEs, have a non-exporting profile, attain productivity levels above average, pay higher wages and are concentrated on the following sectors: commerce, construction and industry.

This paper fulfills a gap in the literature since: i) distinguishes not only between domestic and foreign-owned firms, but also between wholly and partly foreign-owned firms; ii) examines the possible non-linearity of the ownership-performance relation; and iii) uses a set of control variables and tests the presence of moderating and interaction roles between variables. To the best of our knowledge, with the exception of the paper from Barbosa and Louri (2005), this is the first empirical paper examining the relationship between ownership and control levels of foreign subsidiaries with firm performance in Portugal. The choice of a national data set allows us to compare our results with similar studies in other countries (e.g., Dimelis and Louri, 2002; Barbosa and Louri, 2005; Azzam et al., 2013; Gelübcke, 2013). From this comparison we expect to gain some insights into country-specific factors influencing the performance of SMEs, which are frequently rooted in the domestic environment (Narayanan, 2015; Stouraitis et al., 2017) and at the same time understand the importance of the performance-promoting channel of FDI, particular when assuming the form of JVs.

The rest of the paper is structured as follows. The next section reviews the literature on the relation between foreign ownership and firm performance. The section also presents the other determinants of performance and the hypotheses to be tested in the paper. Section three presents the variables, the data and the methodology to be used. The following section presents and discusses the empirical results with the final section presenting some concluding remarks.

2 Literature review

The present paper is focused on the determinants of firm performance assessing if performance is influenced by the presence and magnitude of foreign capital. Firm performance is a multidimensional construct heavily researched in the literature (e.g., Venkatraman & Ramanujam, 1986), but here we are interested on the association of performance with the firm's ownership and control structure, in particular the effects of foreign ownership. Modes of entry and equity ownership are key variables in international business research (e.g., Li and Guisinger, 1991; Nitsch et al., 1996) and the impact of corporate governance on firms' strategic decision-making and performance has been well documented in the literature (e.g., Shleifer and Vishny, 1986; Demsetz and Villalonga, 2001), mostly for large and listed firms, but the idiosyncrasies of SMEs and the presence of foreign capital associated with different firms' performance has been less studied.

2.1 The characteristics of foreign-owned firms and their impacts on performance

A group of authors suggested that foreign-owned subsidiaries possess a set of firm-specific advantages that aren't available to domestic firms, such as access to technological, financial and human resources or the ability to exploit economies of scale, that enhance their performance and results (Harris, 2002; Harris and Robinson, 2003; Yudaeva et al., 2003; Caves, 2007; Girma and Görg, 2007; Temouri et al., 2008; Halkos and Tzeremes, 2010).

Despite the generally accepted hypothesis that foreign-owned firms outperform domestic firms, at least in developing or emerging countries, several authors found evidence of little or no superior performance (e.g., Globerman et al., 1994; Griffith, 1999; Konings, 2001; Barbosa and Louri, 2005; Benfratello and Sembenelli, 2006; Huang and Shiu, 2009; Azzam et al., 2013). Domestic firms may possess a better knowledge of the local environment or have the necessary connections with political and local authorities. Other authors argued that the divergent results between countries were due to country-specific factors (e.g., Barbosa and Louri, 2005; Gelübcke, 2013).

A large number of papers present the limitation of adopting a simple view, using a dummy variable to distinguish firms between foreign-owned and domestic-owned, not properly analysing the situations in-between, for instance the presence of JVs, with varying degrees of foreign ownership. For instance, when studying different countries and time periods, some authors generally evidenced that firms characterized by different degrees of foreign ownership may perform differently (Blomström and Sjöholm, 1999; Dimelis and Louri, 2002; Greenaway et al., 2014).

Blomström and Sjöholm (1999) showed that foreign ownership is associated with higher labour productivity but that doesn't depend whether firms are majority or minority owned by foreigners and Dimelis and Louri (2002) evidenced that foreign ownership entails a productivity advantage, which is more important in fully or majority foreign-owned firms. More recently, using several measures of performance, Greenaway et al. (2014) found that JVs perform better than wholly foreign-owned and purely domestic firms. Although productivity and profitability initially rise with foreign ownership, they start declining once ownership exceeds about 60%. This interesting non linear relation, also found by Hintosova and Kubikova (2016), suggests that some domestic ownership is necessary to ensure optimal performance.

Differences in performance between firms can be related to differences in firm-specific advantages, as well as differences in industry's characteristics where firms operate. Theoretically, in the context of competitive markets it is expected that within the same industry firms converge to similar levels of performance (Cubbin and Geroski, 1986). Hansen and Wernerfelt (1989) and Rumelt (1991) evidence that industry effects played a modest role in explaining the variability in performance. Thus, it is relevant to study if there are significant differences between foreign-owned and domestic firms within particular industries, where the specificities of both type of firms could exert some influence.

Another interesting topic, grounded in the institutional economics literature, are the issues of development differences and institutional distances, that is the question if performance could be affected by the country of origin of share capital and its development/institutional distance towards the host country (e.g., Chari and Shaikh, 2017). The recent paper from

Trapczynski and Banalieva (2016) presents a complete literature review on this issue but, albeit the “paradox of distance”, most of the literature points that a larger institutional distance reduces firm performance due to higher uncertainty and transaction costs (Zaheer, 1995; Zaheer and Hernandez, 2011).

As a result of this literature review, we can now state a first set of hypotheses to be tested:

- H1: The degree of foreign ownership is positively related with firm performance
 - H1a: Foreign ownership has a positive effect on profitability
 - H1b: That effect is non-monotonic
 - H1c: That effect differs between sectors of activity
- H2: Firms with foreign share capital coming from more institutionally developed countries present higher levels of profitability

2.2 Additional determinants of performance

Even though our paper is focused on the relation between foreign presence in firms’ equity and performance, following previous authors (e.g., Grenaway et al., 2014; Trapczynski and Banalieva, 2016), it is included a set of control variables in order to rule out alternative determinants of the sampled firms’ performance. Besides their direct impact on performance, we intend to explore the moderating role of some organizational characteristics in influencing the foreign ownership-performance relationship. These variables are traditionally used in studies about performance determinants: firm age, size, internationalisation and debt.

Theoretically, older firms should possess a greater stock of knowledge and experience, which could have a positive impact on performance. Older firms have enjoyed the benefits of learning, are not prone to the liabilities of newness and can, therefore, enjoy superior performance. For example, brand, reputation and legitimacy are some strategic resources that firms build with time. Older firms could also be better equipped to learn from their experiences in the past and would possess more skills to implement their learning in new undertakings (Singla and George, 2013). Yet, as firms age they tend to become more conservative and prone to inertia, having difficulties in dealing with changes in their competitive environment (Hannan and Freeman, 1984; Aggarwal and Gort, 1996). Albeit the impact of age on performance is ultimately an empirical question, our expectation is that age negatively moderates the effect of foreign ownership on performance since foreign firms have to face a learning process when operating in a new and unfamiliar environment.

Regarding the impact of size on performance, the literature points to the fact that size can be a source of competitive advantage because larger firms have at their disposal greater technical and commercial opportunities, allowing them access to economies of scale, greater bargaining power and the capability to raise barriers to deter potential competitors or have an easier access to capital markets (Dhanaraj and Beamish, 2003; Thomas and Eden, 2004). Nevertheless, fixed costs, increased monitoring needs and organizational inefficiencies associated with larger size could outweigh the benefits of increased market power, with the larger flexibility of smaller firms being a competitive advantage (Chen and Hambrick, 1995) or size could only influence performance in certain industries, given specific differences in terms of the degree of competition or the existence of economies of scale (Bamiatzi et al., 2016). According to the agency theory, it is expected a negative relationship between size and profitability, since the separation of ownership and control creates a conflict between

managers and shareholders, which in turn could shift the objective from maximizing benefits for others towards management, such as survival or growth. In sum, the literature is ambiguous about the existence of competitive advantages positively related to size, so that the sign of that relation remains an empirical issue.

The discussion of the effects of internationalization on performance has mainly covered large firms, with the literature generally finding a positive relation between internationalization and performance (Lu and Beamish, 2004; Hsu et al., 2013). Lu and Beamish (2006) argue that exporting has been extensively employed by firms as an internationalization strategy. Empirical studies on samples of SMEs have revealed the existence of a “liability of foreignness” at the beginning of the internationalization process via FDI, and a positive relationship between exports and profitability. Empirical results of prior studies have been inconclusive with some studies finding a positive impact of the degree of internationalization (e.g., Kim et al., 1989; Qian, 2002; Tsao and Chen, 2012; Hsu et al., 2013), others finding no effect (e.g., Hoskisson and Hitt, 1990; Morck and Yeung, 1991; Vithessonthi, 2016) and still others finding a negative effect (e.g., Singla and George, 2013; Xiao et al., 2013; Vithessonthi and Racela, 2016).

Regarding leverage, some studies show that SMEs prefer going into debt before increasing capital to finance their investments, thus avoiding the entry of external shareholders (Anderson et al., 2003). However, other studies show that SMEs prefer to be more prudent, not going into debt in order to avoid losing their independence to creditors (López-García and Aybar-Arias, 2000). Given that SMEs could have specific concerns in terms of privacy, control and generational transition, they tend to prefer internal financing policies, favouring the reinvestment of their own funds to capital increases or long-term debt (Gallo et al., 2004), nevertheless, their attitude towards debt could change as generations, managers and the business as a whole evolves (Lussier and Sonfield, 2009). Debt ratios are included because a firm’s ownership may influence its capital structure (Demsetz and Lehn, 1985; Randøy and Goel, 2003) and, in line with the agency and pecking order theories we expect a negative relationship between SMEs indebtedness and its financial performance.

So, regarding the control variables, we state the following set of hypotheses:

H3: The relation between foreign ownership and performance differs between younger and older firms, the latter being more profitable

H4: The relation between foreign ownership and performance differs between larger and smaller firms, the former being more profitable

H5: The relation between foreign ownership and performance differs between export oriented and domestic oriented firms, the former being more profitable

H6: The relation between foreign ownership and performance differs between more or less indebted firms, the latter being more profitable.

3 Materials and methods

3.1 Dependent and independent variables

Prior studies have used a broad range of performance measures ranging from outcomes achieved in the product markets (such as sales growth: Siddharthan and Lall, 1982; Grant, 1987), to accounting measures (such as ROA, ROS and ROE: Riahi-Belkaoui, 1998; Lu and

Beamish, 2001) as well as market-based measures (such as Beta and risk-adjusted returns: Michel and Shaked, 1986; Goerzen and Beamish, 2003). A key problem with narrow measures is that they may not be representative of firm performance, which may differ from traditional profitability ratios (Pangarkar, 2008). Firm performance measures tend to be related, as firms with greater productivity are more likely to have greater profitability and to experience higher rates of growth. Nevertheless, they can display low levels of correlation (Thomsen and Pedersen, 2000). For instance, many SMEs in the early stages of their evolution might place a strong emphasis on sales growth.

Due to data availability, and in line with the Industrial Organization paradigm, it is assumed that all firms are profit-maximizing and, accordingly, their performance will be measured by profitability variables. The use of ROA is widely supported by the literature and has been used in several studies analyzing the relationship between internationalization and firm performance (e.g., Barbosa and Louri, 2005; Grenaway et al., 2014; Trapczynski and Banalieva, 2016), being generally considered to be a key performance indicator and superior to alternative measures such as ROE which is sensitive to the firm's capital structure (Miller et al., 2016). Additionally, ROA and related profitability measures can be easily computed from financial statements and compared in cross-country surveys.

ROA is computed as net income scaled by the book value of total assets. In order to check robustness, we also proxy financial performance by the ratio between EBITDA and total assets (REBITDA) and by the ratio between EBIT and total assets (REBIT). The variable return on sales (ROS) is also tested as a profitability measure being computed as net income divided by total sales.

The independent variable foreign ownership (FO) is computed as the percentage of the firm's capital that is foreign-owned, being expected a positive relation with profitability. This is a common way to measure foreign ownership, and was for example used by Halkos and Tzeremes (2010), Greenaway et al. (2014), Konings (2001) and Hintosova and Kubikova (2016) among others.

We assume that when the foreign share capital comes from a country that is more institutionally developed than the host-country that should be beneficial for the firm, benefiting from the experience and cost-efficient methods brought by foreign capital. So, the variable institutional difference (INST) between the host-country and the country of origin of the share capital is measured using Holmes et al. (2008) *Heritage Index of Economic Freedom* ($INST = \text{Portugal's yearly index} - \text{parent country yearly index}$). This index ranges from 0 to 100, with higher values indicating greater economic development. More positive (negative) values for INST indicate that the host-country is more (less) institutionally developed than the parent-country, being expected a negative (positive) relation.

3.2 Control variables

Even though our paper is focused on the relation between the degree of foreign ownership and performance, we include the following set of control variables in order to rule out alternative determinants of the sampled firms' performance: firm age, size, internationalization and debt.

For kurtosis reasons, variables age (AGE) and size (SIZ) are measured, respectively, as the log of the number of years since the firm's inception and the log of total assets.

Concerning the variable "internationalization" (EXP), we will use that traditional variable of exports' intensity (ratio of foreign sales to total sales) and the debt level of the firm is measured by short-term (STD) and long-term debt (LTD), respectively, Current liabilities/ Total assets and Non-current liabilities/ Total assets.

3.3 Data and methodology

This paper analyses a sample of SMEs from the industrial sectors (codes 10 to 32, from the *European Classification of Economic Activities – NACE – Rev. 2*) obtained from SABI (*Sistema de Análise de Balanços Ibéricos*), a financial database powered by Bureau van Dijk (with the exception of the variable measuring "institutional difference"). Applying the criteria for SMEs definition (Commission Recommendation 2003/361/EC), thus excluding a large number of micro firms (which employ fewer than 10 persons and whose annual turnover and/or annual balance sheet does not exceed 2M€), considering only firms already existing in 2010 and presenting complete data from 2010 to 2017, excluding firms with negative debt ratios or equity and liabilities greater than assets and winsorizing the observations below (and above) the 1st (and 99th) percentile, in order to eliminate spurious outliers, we obtained a balanced panel data of 5.722 SMEs distributed by all industrial sectors.

Table 1 presents a detailed description of our sample. The sample is composed of mature SMEs, with an average age of 30 years, accounting for 229.708 employees, a turnover near 23.000 M€, total assets of 23.930 M€ and an average ROA of 2,9% in 2017. The sample has 76,4% of small firms (4.372) and 23,6% of medium firms (1.350) and all relevant sectors are represented. The average percentage of foreign ownership is around 4%, with 269 firms with partial or total foreign ownership, with share capital coming from 28 different countries. In those 269 firms there are 198 wholly foreign-owned firms and 71 JVs, respectively with average ROAs of 4,2% and 3,0%. Foreign ownership is more relevant in highly capital intensive sectors, such as sectors 19/20/21, 27, 29 and 30.

Before estimating the different models we present in Table 2 some descriptive statistics and the correlation matrix of the variables. The sample's mean values for the different variables, differentiating between the two kinds of firms are presented, together with the results of a test for differences in mean values between the two sub-samples. Notice that foreign firms present better performance measures, are larger, export-oriented and display lower levels of indebtedness. The t-tests for equality of means show that there are considerable differences between domestic and foreign-owned firms with regard to profitability. Also, we find a preference for foreign firms for larger size and less debt, which may contribute to the positive differential in profitability.

Regarding the correlation coefficients, they are generally low, with foreign ownership negatively correlated with institutional difference, meaning that foreign share capital comes mainly from more developed countries.

Table 1 – Distribution of the sample by industry classifications

Industry Classification (NACE)	Number of Firms	Small firms (%)	Aver. number of empl.	Average sales (th€)	Exports (%)	Average EBITDA	Foreign ownership
Food products (10)	821	78,6%	36,2	5.049,0	7,6%	351,1	2,4%
Beverages and tobacco (11/12)	129	88,4%	26,5	4.702,1	27,7%	741,1	7,0%
Textiles (13)	327	71,2%	47,8	4.756,4	32,0%	496,4	3,2%
Wearing apparel (14)	457	66,1%	52,0	3.795,2	61,5%	265,4	1,4%
Leather and related products (15)	394	58,9%	53,7	3.869,3	49,2%	281,9	2,0%
Wood and of products of wood and cork (16)	323	86,4%	30,8	3.584,6	26,3%	335,4	2,0%
Paper and paper products (17)	108	68,5%	51,4	7.452,4	15,3%	724,9	10,1%
Printing and reproduction of recorded media (18)	199	86,4%	29,6	2.161,4	5,2%	306,7	0,5%
Refined petroleum, chemicals, man-made fibers and pharmaceutical products (19/20/21)	161	73,9%	44,5	7.431,9	19,0%	753,9	16,7%
Rubber and plastic products (22)	306	73,2%	44,0	5.512,5	23,7%	692,6	6,9%
Other non-metallic mineral products (23)	443	81,0%	34,8	3.008,8	30,7%	426,2	4,0%
Basic metals (24)	55	61,8%	52,8	7.503,2	34,6%	824,3	4,6%
Fabricated metal products (25)	995	80,7%	35,7	3.153,1	27,2%	404,1	3,6%
Computer, communication and electronic equip. (26)	27	66,7%	61,4	7.037,7	36,5%	618,7	11,1%
Electrical equipment (27)	111	77,5%	40,5	4.260,5	30,0%	437,5	9,7%
Machinery and equipment (28)	285	76,5%	40,3	3.916,3	32,7%	482,6	5,5%
Motor vehicles, trailers and parts (29)	86	62,8%	53,0	4.874,2	40,5%	521,2	12,8%
Other transport equipment (30)	22	54,6%	58,7	6.106,5	45,2%	625,9	18,2%
Furniture (31)	341	82,1%	32,0	1.947,8	32,7%	218,1	0,9%
Other manufacturing activities (32)	132	84,9%	31,3	2.073,0	19,3%	193,7	6,1%
	5.722	76,4%	40,1	4.019,0	28,6%	411,9	4,0%

Note: Small firms are firms with less than 50 employees. Sectors 11/12 and 19/20/21 are aggregated since the sample only comprises a very small number of firms in sectors 12, 19 and 21.

The relation between performance and foreign ownership is addressed with a panel data methodology estimated through three different regression models: Pooled Ordinary Least Squares (POLS), Fixed-Effects Model (FEM) and Random-Effects Model (REM). Applying the Breusch-Pagan and Hausman tests to choose the most appropriate regression technique, the Breusch-Pagan test leads to the rejection of the null hypothesis, indicating that REM is more appropriate than POLS whereas the Hausman test leads to the non-rejection of the null hypothesis that REM is preferable to FEM.

Table 2. Descriptive statistics and correlation matrix between independent variables

	Domestic firms (n = 5453)	Foreign firms (n = 269)	Mean differ. (t-test)	FO	INST	AGE	SIZ	EXP	STD	LTD
ROA	2,9%	3,9%	5,62 (***)	0,034 (***)	-0,042 (***)	-0,091 (***)	0,049 (***)	0,085 (***)	-0,123 (***)	-0,170 (***)

REBITDA	9,4%	10,2%	3,94 (***)	0,021 (***)	-0,038 (***)	-0,164 (***)	-0,011 (**)	0,042 (***)	-0,097 (***)	-0,092 (***)
REBIT	4,9%	6,0%	5,34 (***)	0,032 (***)	-0,042 (***)	-0,109 (***)	0,045 (***)	0,088 (***)	-0,091 (***)	-0,145 (***)
ROS	2,2%	2,5%	1,17 (***)	0,003 (***)	-0,013 (***)	-0,015 (***)	0,031 (***)	-0,027 (***)	-0,053 (***)	-0,071 (***)
FO	...	85,7%	...	1	-0,535 (***)	0,007 (***)	0,222 (***)	0,164 (***)	-0,015 (***)	-0,050 (***)
INST	...	-4,6	...	1	-0,003	-0,148 (***)	-0,117 (***)	0,025 (***)	0,030 (***)	
AGE	3,1	3,1	0,69		1	0,285 (***)	0,038 (***)	-0,217 (***)	-0,111 (***)	
SIZ	7,4	8,7	56,96 (***)			1	0,277 (***)	-0,086 (***)	0,007 (***)	
EXP	26,3%	52,5%	32,13 (***)				1	0,073 (***)	-0,048 (***)	
STD	41,1%	39,0%	-4,46 (***)					1	-0,289 (***)	
LTD	16,4%	13,0%	-9,66 (***)							1

Note: * p < 0,10; ** p < 0,05; *** p < 0,01

“Domestic firms” are firms with fully national share capital; “Foreign firms” are firms with partial or total foreign ownership; ROA = return on assets; REBITDA = EBITDA/total assets; REBIT = EBIT/total assets; ROS = return on sales; FO = percentage of foreign share capital; INST = $HIEC_{Portugal} - HIEC_{parent\ country}$; AGE = logarithm of firm age, in years; SIZ = firm size, measured by the logarithm of total assets; EXP = total exports as a percentage of total sales; STD = current liabilities/total assets; LTD = non-current liabilities/total assets.

4 Results and discussion

4.1 Empirical results

The regression results for the random-effects model are presented in Table 3, where the three alternative dependent variables (ROA, REBITDA and REBIT) are run on the variables “foreign ownership” (FO) and “institutional difference” (INST) and the control variables AGE, SIZ, EXP and debt (STD and LTD). The results with ROS as the dependent variable are not presented since are very similar to the others. Variables with the suffix FO are interaction variables with a foreign ownership dummy, in order to see if the effects of those variables are statistically different between 100% domestic firms and partial or totally foreign owned firms, thus testing our hypotheses. Table 4 presents the separate results for the domestic and foreign firms’ sub-samples, considering ROA as the dependent variable, albeit the results for REBITDA, REBIT and ROS are very similar. With the full specifications the random-effects model results present a goodness of fit near 10%.

Table 3. Random-effects model results

	ROA	REBITDA	REBIT	ROA	REBITDA	REBIT	ROA
C	0,029*** (0,000)	0,029*** (0,001)	0,094*** (0,001)	0,049*** (0,001)	0,103*** (0,004)	0,239*** (0,005)	0,133*** (0,005)
FO	0,000** (0,000)		0,000 (0,000)	0,000** (0,000)	-0,000*** (0,000)	-0,000*** (0,000)	-0,001*** (0,000)
INST		-0,001*** (0,000)	-0,001*** (0,000)	-0,001** (0,000)	-0,000 (0,000)	-0,001 (0,000)	-0,000 (0,000)
<i>Controls</i>							
AGE					-0,021*** (0,001)	-0,036*** (0,001)	-0,024*** (0,001)
SIZ					0,007***	0,005***	0,007***

					(0,000)	(0,001)	(0,001)	(0,000)
EXP					0,017***	0,018***	0,020***	0,017***
					(0,001)	(0,002)	(0,002)	(0,001)
STD					-0,103***	-0,121***	-0,107***	-0,103***
					(0,002)	(0,003)	(0,002)	(0,002)
LTD					-0,119***	-0,134***	-0,126***	-0,117***
					(0,002)	(0,003)	(0,003)	(0,002)
AGE_FO								0,000
								(0,000)
SIZ_FO								0,000**
								(0,000)
EXP_FO								-0,000
								(0,000)
STD_FO								0,000
								(0,000)
LTD_FO								-0,001***
								(0,000)
<i>Overall R²</i>	0,01	0,01	0,01	0,01	0,10	0,07	0,08	0,10

Notes: Standard-deviations presented in brackets. * p < 0,10; ** p < 0,05; *** p < 0,01.

Table 4. Random-effects model results: “domestic firms” and “foreign wholly or partial owned firms” (ROA as dependent variable)

	Domestic firms (n = 5453)	Foreign firms (n = 269)	
C	0,106*** (0,004)	0,033 (0,027)	0,037 (0,028)
FO			-0,000 (0,000)
INST			-0,000 (0,000)
AGE	-0,021*** (0,001)	-0,013*** (0,005)	-0,012** (0,006)
SIZ	0,006*** (0,000)	0,012*** (0,003)	0,012*** (0,004)
EXP	0,017*** (0,001)	0,014** (0,007)	0,014 (0,012)
STD	-0,103*** (0,002)	-0,107*** (0,011)	-0,107*** (0,017)
LTD	-0,116*** (0,002)	-0,177*** (0,014)	-0,177*** (0,028)
<i>Overall R²</i>	0,10	0,10	0,10

Notes: Standard-deviations presented in brackets.

* p < 0,10; ** p < 0,05; *** p < 0,01.

Since one of the objectives of this paper is to test the presence of non-linear effects of foreign ownership in performance, we alternatively test the variables FO and INST and their squares as independent variables, for the sub-sample of “foreign firms” (Table 5). Notice that, only the most significant results are presented.

Table 5. Random-effects model results: Testing the presence of non-linearities

	ROA	ROA	ROA	REBITDA	REBIT
C	0,051** (0,023)	0,055** (0,023)	0,033*** (0,004)	0,094*** (0,005)	0,053*** (0,005)
FO	-0,001 (0,001)	-0,001 (0,001)			
FO ²	0,000	0,000			

	(0,000)	(0,000)			
INST	0,001 (0,000)		-0,001* (0,000)	-0,001* (0,001)	-0,001 (0,001)
INST ²	0,000** (0,000)		0,000* (0,000)	0,000* (0,000)	0,000* (0,000)
<i>Overall R²</i>	0,02	0,01	0,02	0,02	0,02

Notes: Standard-deviations presented in brackets. * p < 0,10; ** p < 0,05; *** p < 0,01.

Finally, testing the presence of differences between industries, Table 6 presents the results for the different sectors of activity.

4.2 Discussion

We now analyse the results at the light of the different hypotheses. The first rows in Table 3 evidence that “foreign ownership” seems to have only a slightly negative impact on performance thus not confirming H1a and the results from Hintosova and Kubikova (2016). This lack of evidence that foreign-owned firms perform better than domestic firms is in line with the results reported by Konings (2000) and Barbosa and Louri (2005), meaning that the knowledge of the domestic market may be a important factor for profitability. Well established relationships among domestic firms, their owners and their managers, provide some advantages to domestically-owned firms that cannot be attained by foreign-owned firms. Additionally, for the full sample, institutional difference seems unimportant to explain performance differences between firms.

Table 6. Random-effects model for different manufacturing sectors. ROA as dependent variable

	CAE 10	11/12	13	14	15	16	17	18	19/20/21	22
C	0,093*** (0,012)	0,033 (0,034)	0,092*** (0,021)	0,118*** (0,020)	0,163*** (0,017)	0,115*** (0,026)	0,103*** (0,029)	0,119*** (0,030)	-0,005 (0,035)	0,122*** (0,020)
FO	-0,000* (0,000)	-0,001*** (0,000)	-0,000 (0,000)	0,006 (0,001)	-0,000 (0,000)	-0,000** (0,000)	-0,000 (0,000)	0,000 (0,000)	0,000 (0,000)	-0,000* (0,000)
INST	-0,001 (0,000)	-0,002 (0,001)	-0,002 (0,003)	-0,002 (0,002)	-0,000 (0,002)	-0,001 (0,001)	0,002 (0,003)	-0,001 (0,001)	-0,000 (0,001)	-0,001 (0,001)
AGE	-0,014*** (0,003)	-0,009* (0,005)	-0,019*** (0,005)	-0,040*** (0,005)	-0,033*** (0,004)	-0,019*** (0,004)	-0,016*** (0,006)	-0,017*** (0,004)	-0,021** (0,009)	-0,016*** (0,004)
SIZ	0,005*** (0,001)	0,007* (0,004)	0,009*** (0,002)	0,016*** (0,003)	0,009*** (0,002)	0,003 (0,002)	0,007** (0,003)	0,003 (0,003)	0,017*** (0,004)	0,005** (0,002)
EXP	0,014** (0,007)	-0,005 (0,009)	0,005 (0,007)	0,011* (0,006)	0,009* (0,005)	0,026*** (0,005)	0,018 (0,016)	0,051*** (0,016)	0,035 (0,024)	0,015* (0,008)
STD	-0,108*** (0,008)	-0,076*** (0,018)	-0,114*** (0,012)	-0,135*** (0,013)	-0,126*** (0,011)	-0,099*** (0,014)	-0,114*** (0,018)	-0,108*** (0,018)	-0,069** (0,028)	-0,133*** (0,012)
LTD	-0,118*** (0,001)	-0,082*** (0,017)	-0,138*** (0,014)	-0,169*** (0,017)	-0,177*** (0,016)	-0,111*** (0,013)	-0,137*** (0,020)	-0,112*** (0,016)	-0,016 (0,021)	-0,145*** (0,013)
<i>Overall R²</i>	0,06	0,14	0,11	0,13	0,18	0,10	0,15	0,08	0,09	0,17

	23	24	25	26	27	28	29	30	31	32
C	0,074*** (0,023)	0,030 (0,064)	0,122*** (0,011)	0,189* (0,108)	0,058* (0,035)	0,122*** (0,025)	0,126*** (0,035)	0,096 (0,098)	0,149*** (0,025)	0,201*** (0,033)
FO	0,000 (0,000)	0,000 (0,000)	-0,000* (0,000)	-0,001*** (0,000)	-0,000 (0,000)	-0,000 (0,000)	-0,000 (0,000)	-0,001*** (0,000)	-0,000** (0,000)	0,000 (0,000)
INST	0,002 (0,002)	0,003 (0,003)	0,001 (0,001)	-0,003 (0,003)	0,005 (0,004)	0,001 (0,001)	-0,002 (0,003)	0,005 (0,005)	0,004*** (0,001)	0,002 (0,003)
AGE	-0,013*** (0,005)	-0,013 (0,010)	-0,026*** (0,002)	-0,037* (0,020)	-0,028*** (0,009)	-0,029*** (0,004)	-0,023** (0,009)	-0,071** (0,030)	-0,021*** (0,004)	-0,032*** (0,006)
SIZ	0,004* (0,001)	0,009 (0,009)	0,008*** (0,001)	-0,006 (0,006)	0,017*** (0,001)	0,008*** (0,001)	0,011*** (0,001)	0,037* (0,016)	0,000 (0,000)	0,004 (0,004)

	(0,002)	(0,007)	(0,001)	(0,008)	(0,005)	(0,003)	(0,004)	(0,019)	(0,002)	(0,003)
EXP	0,020***	0,043	0,013***	-0,011	0,010	0,026***	0,007	-0,074	0,024***	0,003
	(0,005)	(0,040)	(0,004)	(0,024)	(0,011)	(0,007)	(0,011)	(0,051)	(0,006)	(0,011)
STD	-0,092***	-0,081**	-0,114***	-0,091**	-0,093***	-0,096***	-0,180***	-0,117**	-0,116***	-0,138***
	(0,013)	(0,032)	(0,007)	(0,044)	(0,029)	(0,014)	(0,026)	(0,051)	(0,014)	(0,020)
LTD	-0,102***	-0,116***	-0,133***	-0,249***	-0,154***	-0,119***	-0,207***	-0,151***	-0,119***	-0,137***
	(0,013)	(0,038)	(0,007)	(0,071)	(0,036)	(0,018)	(0,029)	(0,047)	(0,014)	(0,021)
Overall R ²	0,06	0,04	0,13	0,14	0,10	0,13	0,23	0,11	0,13	0,14

Notes: Standard-deviations presented in brackets.* p < 0,10; ** p < 0,05; *** p < 0,01.

Considering only the wholly or partial foreign-owned firms and regarding the possibility of a non-linear relationship, the results presented in Table 5 show that institutional difference displays a significant U-shaped relation with performance. Figure 1 plots this interesting result, showing that firms with foreign share capital coming from more institutionally advanced countries (lower levels for INST) display increasingly levels of profitability, whereas capital from lagging countries result on lower levels of profitability. This result, which partially confirms H2, evidences the potentially low levels of performance obtained by firms where part or whole of the capital comes from less developed countries, lacking the necessary resources, technologies and managerial and international networking skills to obtain higher levels of profitability (Huang and Shiu, 2009; Greenaway et al., 2014).

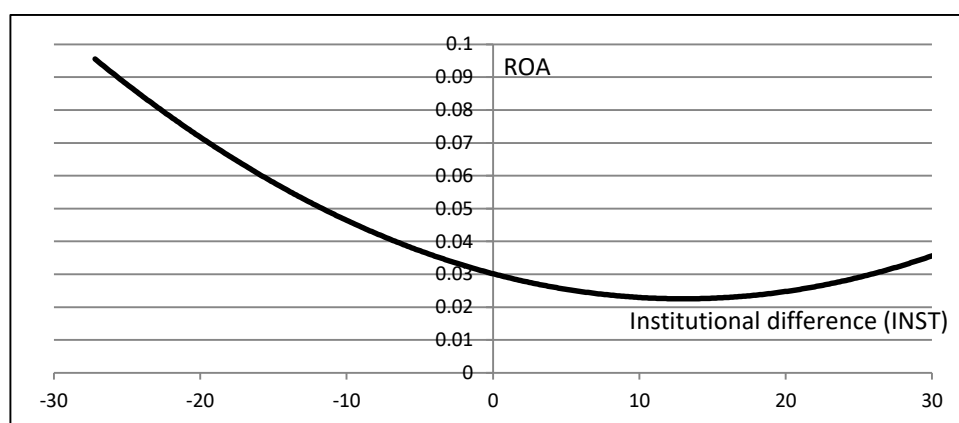


Figure 1. Effect of institutional difference on performance

The quadratic nature of the relationship between institutional difference and performance calls for major attention to these effects by policymakers, who should focus their energies in attracting FDI from significantly more developed countries, enhancing the performance results of those firms and their spillover effects to the economy.

Regarding the other hypotheses related with the control variables (Table 3), the coefficients are always significant, confirming hypotheses H4, H5 and H6. Regarding the variable AGE, and confirming the results from Barbosa and Louri (2005), firm's age seems to have a negative impact on performance, thus not confirming H3. Possibly, older firms are more likely to be in the maturity phase, with lower levels of growth opportunities and, consequently, lower financial performance levels. Larger firms present a better financial performance as a result of their competitive power and operational efficiency that compensates increased monitoring costs and bureaucratisation. This evidence that bigger firms outperform smaller ones brings an important policy-making implication. Typically, firms in Portugal are micro or small firms, so policymakers should create an adequate set of incentives to foster mergers and

acquisitions, as a way to improve firms' competitiveness. Additionally, and confirming previous results (e.g., Greenaway et al., 2014), export-oriented firms tend to present higher levels of profitability and more indebted firms are less profitable, independently of the maturity of the debt. This result, which is typically found in the literature, is in line with the predictions of the agency and pecking order theories, since a high level of leverage imposes a fixed financial commitment on the firm, reducing the free cash flows available to management (Vieira, 2017). The interaction terms in Table 3 are significant for the variables AGE and debt, giving a strong support to hypotheses H4 and H6 and showing different impacts of those two variables on performance for "domestic firms" and "foreign firms". The stronger impact of firm size and indebtedness on profitability is also evidenced in Table 4, where the respective coefficients present higher values for "foreign firms".

Regarding differences between industries, Table 6 evidences that foreign capital seems to exert a slightly negative effect on performance across sectors, particularly in sectors 10, 11/12, 16, 22, 25, 26, 30 and 31. This negative effect seems to be stronger in those sectors with a larger proportion of small firms and lower internationalization and foreign ownership levels, possibly due to the fact of being highly competitive sectors, with mature firms with well defined markets and networks. There is no evidence of positive effects deriving from foreign capital and institutional differences also seem to be irrelevant.

5 Conclusion

Management theories should not consider firms just as a value maximizing entity regardless of its owners. Different owners and managers have different risk attitudes, face different incentives and bring to the firm different resources, so similar firms could present different degrees of performance. Some recent studies have compared performance between foreign-owned and domestic-owned firms. While some of those studies have found that foreign-owned firms outperform their domestic counterparts, other studies evidenced the opposite. Only a limited number of papers have attempted to examine how the degree of foreign ownership in a firm influences its profitability.

This exploratory paper contributes to fill that gap studying the differences between domestic and foreign-owned firms (wholly or partially owned by foreign share capital). The degree of foreign ownership and institutional difference generally showed a broadly non-significant relationship with performance, meaning that the origin of the capital does not seem to exert any influence of the different firms' profitability levels. Nevertheless, albeit the small coefficients obtained, there seems to exist a non-linear relationship between the development level of the country of origin of the share capital and profitability, with the results indicating that firms with share capital coming from more advanced countries attain a higher performance.

Regarding the main questions addressed in this paper, we can answer that: i) compared to other firms, foreign firms are more profitable; ii) performance is positively impacted when foreign ownership originates from more advanced countries; iii) there is a significant positive relation between firm's size and degree of internationalization with performance and a significant negative impact of firms' age and level of indebtedness on performance.

This paper gives a contribution to the literature about foreign capital impact on performance, studying if there are significant differences between domestic and foreign-owned firms in terms of performance. Nevertheless, some limitations of this study should be mentioned: i) in the first place, firms' performance is affected by many variables that were not considered (e.g., managerial labour and product markets, political and economic factors or even the personality of shareholders and managers), meaning that the results should be treated with caution. Notice that, our results evidence profitability differences between the two types of firms, but those differences are not specifically explained by the employed variables, failing to take account of the complexity of interests that are involved in an ownership structure. Possibly, considering internal factors such as knowledge transfer, R&D, product positioning and marketing, it would be possible to unveil the differing impacts on firm performance; ii) secondly, profit manipulation and transfer pricing by foreign-owned firms could potentially create a bias in profitability measures. So, a multifaceted measurement could be more appropriate (Delios and Beamish, 2004); iii) third, the dataset comprises 5.722 firms, but only 269 have partial or total foreign ownership. Ideally, a larger number of observations and firms, in particular of "foreign firms", allowing a clearer differentiation between wholly foreign-owned firms and JVs, could result in more robust results (notice that, the low variance of our variables FO and INST could be responsible for the non-significant coefficients); iv) finally, a factor that can limit the generalization of the results is that the measures of performance used in the literature differ widely, leaving us with the question whether our results are dependent on the measures used and on the specific context of the Portuguese economy.

Given the importance of the performance-promoting channel of FDI, particularly when assuming the form of JVs, our findings may be of use in the optimization of investment promotion policies. In particular, our results imply that policymakers should develop efforts to attract foreign capital, potentially under the form of JVs, promoting the establishment of international partnerships between domestic firms and firms located in countries with higher levels of institutional development.

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International business performance and the enhancers of the internationalization strategy in Portuguese firms.

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As business has become increasingly global, firms have been defied to develop a distinct approach in terms of business resources, skills and capabilities. The way in which these factors are organized and directed depend upon the role played by the entrepreneur within the company. In other words, the entrepreneur's role can define the company's ability to acquire and operationalize its resources, thus being able to influence business performance, especially of international businesses.

Research on factors affecting internationalization is attracting growing interest, but few empirical works focus on the perspective of the entrepreneur.

Aiming to analyze the existence of an association between international business performance and the factors that act, on the entrepreneur perspective, as enhancers of the internationalization strategy, an online questionnaire survey was conducted with several variables, based on the literature review.

Data collected from the 311 valid responses (Portuguese international firms) were treated by IBM SPSS Statistics 24.0 software. The statistical analyses used were Descriptive Analysis (frequency analysis, descriptive statistics and graphical representations), Inferential Analysis (Spearman's ordinal correlation, Kruskal-Wallis Test and Chi-Square Test), Reliability Analysis (Cronbach's alpha) and Categorical Principal Components Analysis (CATPCA).

In accordance with International New Ventures Theory, the Strategic Choice view and Network theory, we found evidence of the positive correlation between international experience of the employees and the percentage of business that resulted from internationalization. We also concluded that there is evidence of the importance of specific skills of the employees, of propensity to take risks and the importance of Networks, in international business performance.

Keywords: internationalization, international business performance, international experience, skills, networks.

1 Introduction

Two main theoretical models have dominated literature on new firm's internationalization process. The first model is the Internationalization Process Theory, initially developed in the works of Johanson and Wiedersheim-Paul (1975) (Uppsala Model), Johanson and Vahlne (1977) and Johanson and Mattson (1988). The second is the International New Ventures model (INV), first proposed by Oviatt and McDougall (1994) and McDougall, Shane, and Oviatt (1994). According to the internationalization process theory, firms enter new markets gradually, slowly compromising their resources in the development of export activities. The process thus progresses in stages, as firms start to develop locally before expanding to foreign markets (Johanson and Vahlne 1990). The international new ventures model (INV), on the other hand, states that some young SME's rapidly internationalize exporting to distant markets practically since birth. Thus, instead of following a gradual internationalization process, these firms enter international markets almost immediately, without waiting until they have acquired experience in the domestic market with success.

The growing popularity of this new perspective on international new ventures has created a body of literature on this issue and of its influence on international business performance.

2 Literature review

Internationalization theories have been growing interest among researchers. However, as they mainly focused on the internationalization process of big and mature firms, it was thought that they need some other approaches that consider the challenges of small and younger firms. A growing flow of research on international new ventures has sought to understand the causes, processes and outcomes of the decision to enter in foreign markets at an early stage. A common thread concerns the role of learning and knowledge (McDougall and Oviatt 2000; Cumming et al. 2009; Keupp and Gassmann 2009; Duarte et al. 2012). Organizational knowledge or experience, or their absence, was a central explanation for internationalization in original stage-based models (Eriksson et al. 1997; Johanson and Vahlne 1977, 1990). To this perspective, De Clercq et al. (2005: 409) call behavioral view of internationalization. Nonetheless, Oviatt and McDougall (1994) recognized that individual factors, such as international experience, could also influence the pace, the beginning and the performance of internationalization. The perspective on international new ventures thus emphasizes the role of individual knowledge to argue that international ventures do not need organizational experiences, routines or capabilities to succeed in external markets. On the contrary, the international experiences of founders and other key managers can replace such shortcomings (Oviatt and McDougall 1994; Javalgi and Todd 2011). The individual organizational knowledge about outside markets can thus help the company to skip the incremental processes suggested by the Stages perspective (Oviatt and McDougall 2005; Johanson and Vahlne, 2009; Vahlne et al. 2012; Vahlne and Johanson, 2013; Gerschewski et al. 2015; Oura et al. 2015; Rezvani et al. 2017). De Clercq et al. (2005) call this approach strategic choice view. Empirical evidences from Bruneel et al. (2010) also provides important insights on the internationalization of new business, showing that younger firms are able to compensate their limited experiential learning at company level, through learning based on previous experiences of the management team (congenital learning), and through inter-

organizational relationships (vicarious learning). The most common type of vicarious learning discussed in conceptual and empirical works involves learning with a network.

According to the network theory, depending on the position of a company in the network, this will define its range of opportunities and constraints and thus develop its strategies. Rezvani et al. (2017) found that “the greater the power (knowledge, financial resources, etc.) of people and firms in the network, the more information is granted about business opportunities, potential markets, etc., and the more possibilities for them to make use of such information”. Johanson and Vahlne (2009) report that these relationships have a strong impact on market selection as well as on entry mode because they easily identify and exploit new opportunities. According to Rebocho (2010), cooperation networks undoubtedly favour the competitiveness of firms and have become an important tool to support SME’s internationalization. Henriques (2000) states that potentially conflictive relationships and divergent interests are seen as collaborative partnerships around a common goal: internationalization. Santos et al. (2012) and Ibeh and Kasem (2011) argue that networks are even more important for SME’s due to their lack of human, technical and financial resources, in order to be able to internationalize their operations on their own. Integration into a network is likely to strengthen the competitiveness of these firms in the international market. Being a member of a network provides a variety of technical, financial, and perhaps even more important, knowledge about the external market enabling a reduction in the risks of psychological distance.

Fernhaber and Li (2013) make another approach to the importance of knowledge in Network Theory. These authors give us a different perspective on this theory and that fits into the so-called Attention Based View. The established networks contribute effectively to build the knowledge base of a company, which in turn establishes the bases to recognize and value international opportunities (Casillas et al. 2009; Fernhaber and Li 2013; Bai and Johnson 2017). Although several international exposure sources may be present in the external environment, according to the so-called "limited rationality" of Attention-based View (Ocasio 1997, 2011) the different network relations can thus provide entrepreneurs with support in order to direct their attention to the international opportunities most appropriate to the situation of each company. This perspective is confirmed in Bai and Johnson (2017).

Another perspective is the motivation that an entrepreneur directs towards the internationalization that has also been assigned, as we have seen, to external forces. Proponents of the Population Ecology approach argue that external forces such as competition and specific personality traits lead the entrepreneur to seek other opportunities in foreign markets (Westhead et al. 1998). According to Ibrahim (2004) to get a better understanding of the entrepreneur's decision to internationalize, we must understand his mind and its entrepreneurial characteristics. In fact, many schools of thought portray the entrepreneur as an individual driven by a number of environmental factors and by personality traits. Research on entrepreneurship has identified a number of traits associated with entrepreneurs, such as the need for achievement, the propensity to take risks, the locus of control or self-confidence, and tolerance to contexts of uncertainty (Ibrahim and Ellis 2002). It has also been argued that the choice of an entrepreneurial career is related to external factors such as culture (Dana 1993).

Evidence from some empirical studies also reveals that the company's size has an impact on the internationalization decision, namely on the entry mode. Smaller firms, lacking the resources and experience to venture into foreign markets, prefer entry modes with shared solutions (Breda 2010; Fletcher and Harris 2012). Therefore, the constraints faced by small firms (Cuervo-Cazzura and Un 2007) oblige them to seek solutions that minimize risks and the degree of commitment and to use partnerships to internationalize (Acs et al. 1997).

Based on the literature review, it was established the theoretical model on which this empirical study will be based. We decided to focus our attention on the following enhancing factors of entrepreneurial internationalization:

- International Experience of employees (Eriksson et al. 1997; Johanson and Vahlne 1977, 1990; Oviatt and McDougall 1994; De Clercq et al. 2005; Bai et al. 2017);
 - Entrepreneurial Characteristics (the propensity to take risks) and Specific Skills of the employees (Westhead et al. 1998; Ibrahim and Ellis 2002; Ibrahim 2004; Gerschewski et al. 2015; Oura et al. 2015; Rezvani et al. 2017);
 - Relational Networks (Johanson and Mattsson 1988; Leiblein and Reuer 2004; Breda 2010; De Clercq et al. 2012; Fernhaber and Li 2013; Bai and Johnson 2017; Rezvani et al. 2017);
 - Company Age and Size (Tulder et al. 2011; Dess et al. 2008; Breda 2010; Fletcher and Harris 2012);
 - Incentives/support for Internationalization (Churruca and Garcia-Lomas 1995; Brito and Lorga 1999);
 - Physical and psychological distance (Johanson and Vahlne 1977; Johanson and Vahlne 2003).
- In addition, we consider as another variable, the Percentage of business that resulted from internationalization (Turnover), in order to access whether or not those factors that entrepreneurs consider as the most important for the internationalization of their company, significantly influence the results of their internationalization strategy.

3 Methodology

Data collected from the 311 valid responses (Portuguese international firms) were treated by IBM SPSS Statistics 24.0 software. The statistical analyses used for the data analysis were Descriptive Analysis (frequency analysis, descriptive statistics and graphical representations), Inferential Analysis (Spearman's ordinal correlation, Kruskal-Wallis Test and Chi-Square Test), Reliability Analysis (Cronbach's alpha) and Categorical Principal Components Analysis (CATPCA).

4 Results

4.1 Descriptive Analysis (frequency analysis, descriptive statistics and graphical representations)

In order to find the factors that entrepreneurs consider as the most important for the internationalization of their company (evaluated on an ordinal importance scale with 5 categories), we started by comparing the location measures (median, average and mode) and their dispersion measures. We found that the location measurements give identical results for each of the factors, so we choose the average (the most usual measure). Thus, Figure 1 shows the averages of each of the analyzed factors allowing us to identify in a simple way those that are considered by the entrepreneurs, as the most important for the internationalization of their company. As it is perceptible, the four most important factors (in descending order of importance) are “Specific skills of the employees (Skills)”, “Strong propensity of the employees and management team to entrepreneurship and to take risks (Risks)”, “Networks in the destination country (Networks)” and “International experience of the employees (International Experience)”. Only 3,2%, 6,8%, 13,5% and 10,6% consider these factors “nothing or little important”, respectively. It should also be highlighted that, with the exception of “Risks”, all these factors have outliers. In this case, firms attach lower values towards the degree of importance. Although "Risks" variable does not have outliers, it is the one that presents greater dispersion if we compare it with the other factors, after excluding the outliers. It should also be noted that these four factors (that we acknowledge as the most important) are the ones with lower dispersion (variation coefficients lower than 28%).

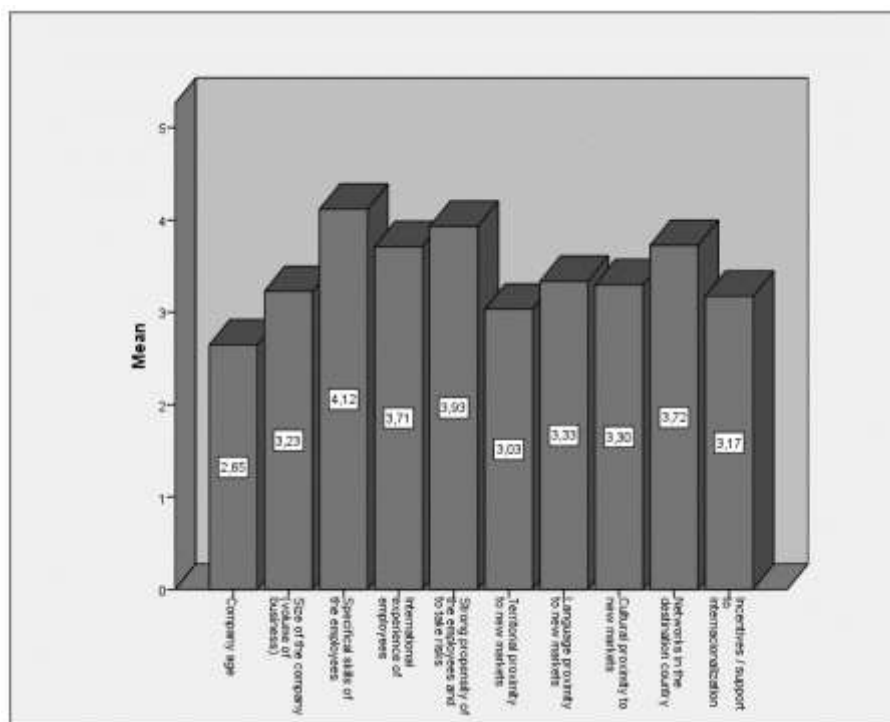


Figure 1: Average of the ten enhancing factors of entrepreneurial internationalization

4.2 Inferential Analysis (Spearman’s ordinal correlation and Chi-Square Test)

But do these factors significantly influence the percentage of business of the company that resulted from the internationalization “Turnover”?

To answer this question, we find it appropriate to start by calculating the Spearman correlation coefficient (used for ordinal variables). Concerning the variable "Turnover" we considered the three following categories: ([0%-25%],]25%-75%] and >75%).

Additionally, the results revealed a positive correlation between "Turnover" and "Skills" and "International Experience" and a negative correlation between "Turnover" and the two other factors. These negative correlations are not considered significant. Nevertheless, the positive correlations are significant at a significance level of 1%.

Then, in order to evaluate more closely the existence of association between the variable "Turnover" and the four most important factors, we performed the Chi-Square test, which led us to conclude that there was an association between "Turnover" and "International Experience" (p-value = 0.028 <0.05).

The contingency table (Table 1) that crosses the variables "Turnover" and "International Experience" also allows us to conclude that 76,4% of the firms with a business percentage above 75%, consider "International Experience" as very important or extremely important; Additionally, firms with less "Turnover" attach less importance to "International Experience". Therefore, we can state that, the greater the importance attached to "International Experience", the greater the percentage of "Turnover" that resulted from internationalization.

Table 1: Contingency table for variables "Turnover" and "International Experience"

			% Turnover			Total
			[0-25%]	]25% -75%]	> 75%	
IE	Nothing or little important	Count	21	7	5	33
		% within IE	63,6%	21,2%	15,2%	100,0%
		% within % of business	14,8%	7,2%	6,9%	10,6%
	Moderately important	Count	43	29	12	84
		% within IE	51,2%	34,5%	14,3%	100,0%
		% within % of business	30,3%	29,9%	16,7%	27,0%
	Very important	Count	58	40	34	132
		% within IE	43,9%	30,3%	25,8%	100,0%
		% within % of business	40,8%	41,2%	47,2%	42,4%
	Extremely important	Count	20	21	21	62
		% within IE	32,3%	33,9%	33,9%	100,0%
		% within % of business	14,1%	21,6%	29,2%	19,9%
Total	Count	142	97	72	311	
	% within IE	45,7%	31,2%	23,2%	100,0%	
	% within % of business	100,0%	100,0%	100,0%	100,0%	

4.3 Categorical Principal Components Analysis (CATPCA)

To summarize the information present in the variable "Turnover" and in the four most important factors for internationalization (measured on an ordinal scale of 1 - nothing or little

important, 2 - moderately important, 3 - very important and 4- extremely important), in principal components, we use a CATPCA with an Equamax method and Kaiser Normalization (Marôco 2018). The variables were weighted by the degree of importance attached to them by the entrepreneurs. For the retention of the components, we used the rule of eigenvalue greater than 1 and the percentage of explained variance higher than 70%. According to the previously mentioned criteria, it is possible to summarize the relational information between the variables in two orthogonal components that explain 71.2% of the total variance of the original variables (Table 2).

The internal consistency of the two components was measured with Cronbach's Alfa (0.878 and 0.865, which shows a very high internal consistency).

Table 2: Model summary rotation

Dimension	Cronbach's Alpha	Variance Accounted For	
		Total (Eigenvalue)	% of Variance
1	,878	5,504	36,695
2	,865	5,173	34,484
Total	,971 ^b	10,677	71,179
a. Rotation Method: Equamax with Kaiser Normalization.			
b. Total Cronbach's Alpha is based on the total Eigenvalue.			

Table 3 shows that variables "Skills" and "Risks" are strongly related with Dimension 1 (first principal component). Variable "Turnover" is also strongly associated with Dimension 2 (second principal component). Additionally, although with less relevance, we can state that variables "International Experience" and "Networks" are correlated with Dimension 1.

Table 3: Principal components extracted from CATPCA

Rotated Component Loadings ^a			
	Variable Weight	Dimension	
		1	2
Turnover	5	,008	,993
Specific skills	4	,880	,178
International exp.	1	,480	,200
Strong propensity to risks	3	,780	-,144
Networks	2	,419	-,085
Variable Principal Normalization.			
a. Rotation Method: Equamax with Kaiser Normalization.			

Based on Figure 2 we can name Dimension 1 as the component of "Knowledge/Entrepreneurship". Dimension 2 clearly represents the percentage of "Turnover" (% of business) that resulted from internationalization. Moreover, in this component there is an opposition between the variables "Networks" and "Risks" (negative

weights) and variables "International Experience" and "Skills" concerning variable "Turnover". These results reinforce those obtained in previous analyzes.

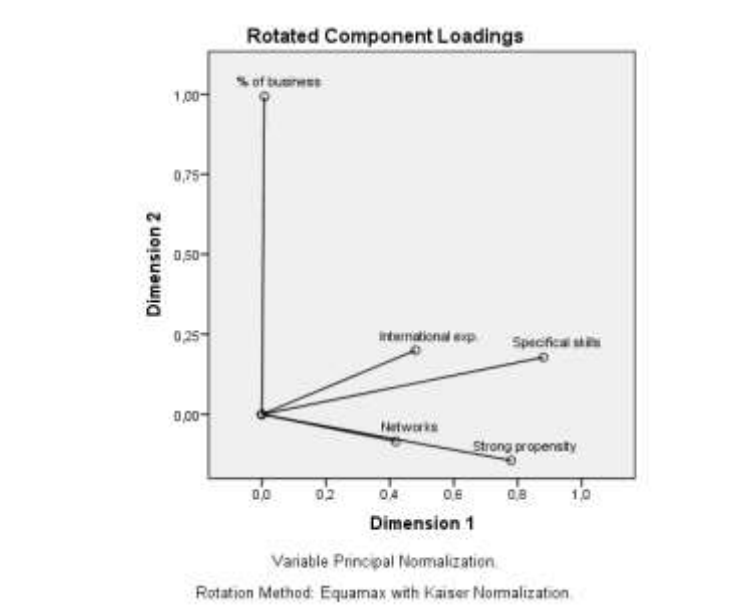


Figure 2: Position of the original variables after CATPCA, in the 2 retained dimensions (with rotation)

5 Conclusions

The central purpose of this work was to examine the existence of association between international business performance and the factors that act, on the entrepreneur perspective, as enhancers of the internationalization strategy. Organizational knowledge or experience, or their absence, was a central explanation for internationalization in original stage-based models. However, Oviatt and McDougall (1994) recognized that individual factors, such as international experience, could also influence the pace, the beginning and the performance of internationalization. This perspective on international new ventures thus emphasizes the role of individual knowledge to argue that international ventures do not need organizational experiences, routines or capabilities to succeed in external markets. We then understand that those factors considered by the entrepreneur, as enhancers of the internationalization strategy, could also be linked to the success of internationalization strategies. As we made clear in this empirical study for the case of Portuguese firms, there is a positive and significant correlation between "Turnover" and "Skills" and between "Turnover" and "International Experience" with special emphasis in the association between "Turnover" and "International Experience". Therefore, we can state that firms with higher success in internationalization (higher turnover that resulted from internationalization) are those that attach great importance to the International Experience of their workers and also to their Specific skills. Ultimately, the four most important factors in the entrepreneur perspective (in descending order of importance) are "Specific skills of the employees", "Strong propensity of the employees and management team to entrepreneurship and to take risks", "Networks in the

destination country” and “International experience of the employees”. In the entrepreneur perspective, these factors are configured in order to increase the international performance of the firm.

In future works we intend to perform a cluster analysis to verify whether there are any differences between industries.

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Relations between Public Moral, Academic Ethics and University System's Quality

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Abstract: Despite many positive changes since the Velvet revolution in 1989 – including a positive economic development of the new independent country – no Slovak university afforded to promote among the top 500 World universities. Inversely, indicators of their stagnations can be observed. Our personal communication with partners from other Central and Eastern Europe (CEE) indicates that their local situation demonstrates many similarities. In the region, universities and governments experience problems of ethics and morals: corruption, plagiarism, deflation of values. We have decided to study a relation between low moral of society in a country and quality of its tertiary education. Universities do not exist in a vacuum. We hypothesize that their exhibited problems are a consequence of the faulted leadership at the country-wide level. Their functions reflect the overall social, economic and political situation of their surroundings. These considerations resulted in our comparison of the public moral data (taken from Global Competitiveness Report) and the position of universities in international rankings of universities. The Global Competitiveness Report ranks 137 countries taking as the base not only economic factors but also some describing the function of their government and community. Its data therefore allow to compare more than just a economic and financial strenght of the country but also additional factors. In this paper, we will analyze relationships between deficiencies of the state services and its development of human resources.

Keywords: Academic ethics, quality of university education, Central and Eastern Europe tertiary education.

1 Introduction

Globalisation has increased the social space, leading to borderless economic, ecological, financial, social, political and cultural dimensions for traditional societies, driven by a world changing at an unprecedented rate. This includes the university environment. Stueckelberger (2002, p. 158) emphasises an imbalance between industrial progress and social development by suggesting that “*the technological and economic speed of globalization has to slow down a bit (decelerate) and the ethical, cultural and political globalization has to speed up substantially (accelerate)*”. Education is a way supporting this aim.

Craft (1984) points to two potential Latin roots of the English word “education”. It can be *educare*, which means to train or to mould, or *educere*, meaning to lead out. In our opinion,

to lead others means the ability to lead them to knowledge, methods and higher standards – including ethical ones. In the Western society, these aims are influenced by Aristotle’s thought that equals should be treated as equals (Chroust and Osborn, 1942) which can be interpreted in various directions. Examples are Robert Nozick’s (1974) views on entitlement, John Rawls’s (1971) emphasis on justice and fairness, Alasdair MacIntyre’s (1984) justice as desert. In a broad meaning, academic ethics can become a tool to teach original thinking, to educate in a suitable (and generally accepted |) form of thinking and behaving. It suggests the necessity of existence of ties between moral standards of society/country and quality of its tertiary education. The links can be bi-directional. For that reason, our below data compare selected factors of country’s socio-economic characteristics with rankings its universities.

Evidently, similar relations can be studied at all levels of all countries’ educational systems. On the other hand, the presence of international rankings of universities makes the comparisons at this level easier. For this reason, we consider universities as representatives of all kinds of tertiary education which includes not only universities and colleges but all sorts of post-secondary technical and vocational education and training (TVET) institutes, community colleges, nursing schools, research laboratories, centres of excellence, distance-learning centres and many more (WorldBank, 2016). Our primary research object is Slovakia but other countries of Central and Eastern Europe that were under Communist rules may demonstrate similar patterns due to their shared past.

The political changes after the fall of the Communist regime left the country’s institutions of higher education unprepared for the new challenges. After years of isolation, the universities had to compete with the rest of the World. The previous regime (of then Czecho-Slovakia) had expected academics to build their institutions in accordance with its requested “spirit of loyalty”. The loyalty does not need to be genuine; it could be its imitation (Havel, 1990). Even in such distorted version it was preferred to traditional academic standards as defined for example in (Gallart, 2008).

To control the obedience to the state authorities, the universities adopted a highly hierarchical organisational structure. A strong and well-specified hierarchy has some advantages, especially in the early stages of institutional development. (Clark, 1986) quotes the historian A. B. Cobban: “*The history of medieval universities reinforces that institutional response must follow quickly upon academic achievement if the intellectual moment is not to be dissipated. The absence of regular organization may initially provide a fillup for free-ranging inquiry, but perpetuation and controlled development can only be gained through an institutional framework.*” It also means that some – in particular, the older – Slovak universities could start adapting more liberal organizational structure. The fact that their unified structure is requested by the University Act was criticized by the European Association of University in its regional report (Jensen et al, 2008). In 2016 – 2017, there was a discussion on it (Burjan et al, 2017) but it led to no transformation steps; the law has not been changed yet.

The first chance to change the rigid structure appeared soon after the Velvet Revolution. The universities acted as leaders of the progressive political change. Nevertheless, two factors

hampered their development (Hvorecký, 2012). First, the expansion of entrepreneurship and better-paid employment opportunities provided by incoming international companies caused an extensive outflow of gifted university teachers, especially among younger generations. This resulted in a sudden shortage of vital teachers needed for innovation. The proportion of those who were not in favour of revolutionary change raised. Due to the absence of progressively-thinking teachers, they started to dominate. Secondly, the finance schemes used by the government aim at student numbers rather than at quality of graduates. The initial idea behind it was constructive – to reflect the worldwide trend of the growing proportion of people with tertiary education. In reality, due to the lack of sufficiently qualified faculty, many universities stopped controlling their quality of education. Fearing that the students might leave and enrol with their competitors, they are prepared to pay any price to accommodate them, including their reputation. Above all, the senior staff members who used to comply with the authorities' wishes continue selecting their new staff members from the ranks of those who are ready to do the same. The result has been quite depressing – the decline of academic values. Examples can be found in (Hvorecký, 2015; Krčmárik, 2016). They show that for example research grants are awarded in strange ways, raising suspicion of corruption as well as the favouring of certain institutions over others.

2 Mapping the Slovak University Environment

2.1 University rankings

The first official university (in the sense of a higher-learning, degree-awarding institute) was established in Bologna in 1088 (Festivaldelmedioevo, 2018), next came Paris (1150), followed by Oxford in 1167, Cambridge (1209), Salamanca (1218), Montpellier (1220), Padua (1222), Naples (1224), Toulouse (1229), Prague (1348) and Leuven in 1425 (Compayré, 1902). The word university derives from the Latin: “universitas magistrorum et scholarium”, which means community of teachers and students. Today there are 11 998 universities worldwide, 33 in Slovakia (Webometrics, 2018a, 2018b). These huge numbers make the orientation of community difficult. The university rankings serve as a tool simplifying decision-making of those interested – from the country governments to would-be students.

University rankings have a long tradition, beginning with the classifications of universities from 1870-1890 (Salmi and Saroyan, 2007), the ranking of university graduate programmes (Hughes, 1925), reputational studies in graduate education (Cartter, 1966), the Carnegie Commission's classification listings of colleges and universities (Change, 1973), right up to the global university ranking systems from June 2003, now known as the Academic Ranking of World Universities (ARWU) (ShanghaiRanking, 2016). Since this period, several ranking systems have been developed, e.g. the QS World University Rankings (Quacquarelli Symonds), the Times Higher Education, Global Universities Ranking, HEEACT, Leiden (QS, 2010).

According to the Shanghai – likely the most popular – ranking (ARWU, 2017), 38 countries had their representatives among the 500 top world universities in the year 2007. In 2017, the number of countries grew to 45. The USA still dominates, but the number of U.S. institutions declined from 166 to 135. In the same period, the number of Chinese universities in the top

500 has increased by 20 and of Australian universities by 6. Among newcomers to the list are Estonia, Iceland, Iran, Malaysia, Saudi Arabia, Serbia and Thailand.

Among the countries of Central and Eastern Europe, Slovakia, Hungary, Croatia and Ukraine have no representatives in the ARWU ranking. Till 2016, two Hungarian university were listed in but due to their stagnation, they were overtaken by their competitors. All this indicates that the quality development must be a systematic long-term effort.

The education sector, including expenditure on national education systems, is currently the second-largest sector globally after healthcare (AlpenCapital, 2010), with the higher-education market being very profitable for those countries that have invested in it (Setar and MacFarland, 2012). In addition, international students were worth £25 billion to the UK economy and provided a significant boost to regional jobs and local businesses (Wysetc, 2017).

The number of students enrolled in tertiary education institutions elsewhere than in their home country increased more than threefold from 1.3 million in 1990 to nearly 4.3 million in 2011. The largest numbers of international students are from China, India and Korea. Worldwide, Asian students account for 53% of all students studying abroad. (OECD, 2013). Becker (2009) emphasises that according to the Observatory on Borderless Higher Education, between 2006 and 2009 the number of branch campuses increased by 43% to reach a total of 162. All this implies that some rankings are necessary because despite their disadvantages and different methodologies. They form public opinion and as such direct the flow of would-be students to those positioned higher.

The authors believe that the authority of university-ranking lists is open to question and that there is no single authoritative source. When consulting lists of rankings, it is advisable to examine several of these lists and try to gain some insight into the methodology used to create the ranking. At the same time, conformities between them propose quality indicators. If the ranking are not totally diverse, their “average” ranking can be considered rather convincing.

Table 1 summarises the top Slovak ranked universities in five world ranking systems that take a global view. No ranking places lower than 500 in all rankings indicate that the quality of Slovak tertiary system is disputable.

Table 1: The largest Slovak universities in five worldwide ranking systems

University	Times Higher Education Ranking (2018)	Shanghai Jiao Tong University Ranking	QS Rankings (2018)	Best Global Universities Rankings (2018)	Webometrics (2018)
Comenius University in Bratislava	601-800	-	701-750	511	762
Slovak University of Technology in Bratislava	801-1000	-	-	1065	1137

The Technical University of Kosice (TUKE)	801-1000	-	-	-	1087
Pavol Josef Safárik University in Kosice	-	-	-	894	1613

The largest universities shown in Table 1 are public. Compared to other OECD countries, the Slovak government allocates much less money for education and research (OECD, 2018). Private universities are not subsidized and their access to grant schemes is also restricted. That's why our discussion and conclusions primarily apply to the public tertiary education sector.

Generally, rankings have a useful function, as highlighted by the Institute for Higher Education Policy (2009): Rankings often serve in the place of formal accreditation systems in countries where such accountability measures do not exist (p. 6), prompt change in areas that directly improve student learning experiences (p. 28), encourage institutions to move beyond their internal conversations to participate in broader national and international discussions (p. 1), and foster collaboration, such as research partnerships, student and faculty exchange programmes (p. 2). Nevertheless, Martin (2015) emphasises that *“International rankings are meant to identify the best workplaces, yet none of the rankings evaluate important indicators like job satisfaction, work-life balance, and equal opportunity.”* That why we have to consider other social factors.

2.2 Low moral standards

Misconduct of academicians appears around the World. Table 2 indicates that it has a variety of forms. Some institutions have failed under the global pressure and become prone to a lack of academic integrity (Heyneman, 2009, 2013).

Corruption often seems to be an effective instrument for managing the higher-education system in several countries – both for maintaining the system and for gaining local and international recognition (Denisova-Schmidt, 2016) through different forms such as fraud, plagiarism, bribery, collusion, conflict of interest and favouritism (Osipian, 2008). As universities are an integral part of their society, we believe that coordinated internal and external efforts are necessary to improve the quality of tertiary education.

Table 2: Overview of Corruption in Academic Communities

Author	Definition
Andvig et al. (2000)	emphasise the different forms of corruption and focus on embezzlement, bribery, fraud, extortion and favouritism
Tanaka (2001)	highlights some areas of corrupt behaviour: procurement, administration, and classroom
Chapman (2002)	stresses several forms of malpractice at different levels: ministerial, regional/district and international agencies, as well as in the classroom
Heyneman (2004, 2008, 2009)	notes that corruption affects three major aspects of education: access, equity and quality

Rumyantseva (2005)	distinguishes between corruption with and corruption without student involvement; both forms influence the students' culture and attitudes, the former directly, the latter indirectly
Hallak and Poisson (2007)	also work with areas of corrupt behaviour, but provide a much broader definition; point out the following as possible areas of corrupt behaviour: finance; allocation of specific allowances; construction, maintenance and school repairs; distribution of equipment, furniture and materials; writing of textbooks; teacher appointment, management and training; teacher behaviour; information systems; examinations and diplomas; access to universities; institutional accreditation
Osipian (2009)	defines corruption in education as a system of all informal relations aimed to regulate "unsanctioned access to material and nonmaterial assets"

The authors consider Slovakian situation critical as an extreme due to the cases disclosed recently:

- A proved plagiarist (who happens to be the Dean of the Faculty of Sports) has been appointed to the position of a professor at the Comenius University in Bratislava (Burčík, 2017). The Academic Board which recommended his inauguration consisted of 5 rectores of the biggest Slovak universities, a former and the present president of the Slovak Academy of Sciences, the Chair of the Accreditation Commission, deans of all faculties of the university etc. (Hvorecký, 2019). The recommendation was approved by a majority of their votes.
- (Lehuta, 2018) points to the case of a plagiarist in the position of the Deputy of Rector of the University of St. Cyril and Method in Trnava.
- Comenius University awarded doctoral titles for plagiaristic dissertations to its external German students. The plagiarism was not disclosed by the Slovak institution. It was found out by German website VroniPlag (Cuprik, 2018). The reaction of the Dean was absurd – it happened before the introduction of anti-plagiarism software. As if the academic honesty was the issue of information technology.
- The Chairman of the parliament, Andrej Danko, was accused from the plagiarism of his dissertation. The Matej Bel University found a high degree of identity between his work and five non-cited books – more than 80% – but avoided using the word "plagiarism". (Benedikovičová, Vražda, 2019). The university refused to specify the names of his advisor and members of the commission.

Not only the quality of universities is not high, the aspects of democracy have not developed sufficiently and demonstrate low standards, too. Many Slovak academics believe that their improved financial support will automatically lead to an improvement in the quality of university education, research and leadership. In the authors' opinion, the roots of the problem are much deeper and have both internal and external origins.

3 Socio-economic status in today's Slovakia

Universities do not exist in a vacuum. They are integral parts of society. Thus, its social and economical factors influence them. In our analysis, secondary data are used. They are coming from university rankings and from global data on socio-economical development.

The Global Competitiveness Report (Schwab, 2018) ranks 137 countries. It shows that some factors affecting Slovakian society and its tertiary education do not promote their quality. Below we excerpted the key areas in which Slovakia is ranked in the last quartil among all 137 countries. In the remaining areas, Slovakia achieves better ranking. This moves its competitiveness index higher to the 59th position, i.e. to the lower end of the top half of the Global Competitiveness Report (Schwab, 2018). As the higher ranking primarily reflect the country's infrastructure and industrial development, one can see a gap between them on one side and the quality of the country's social life and its educational system on the other. Most of the post-Communist countries of the region are behind Slovakia: Hungary is in 60th position. Croatia is in 74th position, Ukraine is 86th. One could hypothesise that there is a correlation between the low level of education at universities and the amount of corruption in a country.

Below, we describe four areas with a direct impact on state services and the development of human resources.

3.1 University rankings

The Global Competitiveness Report identifies the most underdeveloped indicators of Slovak institutions in the following fields:

- 109th – Public trust in politicians;
- 119th – Judicial independence;
- 130th – Favouritism in decisions by government officials;
- 129th – Burden of government regulation;
- 131st – Efficiency of legal network in settling disputes;
- 129th – Efficiency of legal network in challenging regulations;
- 106th – Reliability in police services;
- 105th – Ethical behaviour of firms.

The figures show that the Slovak government does not onvite its citizens to discuss improvements. A similar scourge is devastating academic culture around the World. Slovakia is an example of this, with some local variations (see Hvorecký, Višňovský and Porubjak, 2017). Our tertiary education is still quite new and, consequently, immature. The oldest university was established in 1919. In 1990, after the Velvet Revolution, there have only been 12 institutions of tertiary education; the proportion of university educated population was about 10%. During the Communist regime, the system of tertiary education was a variation of the traditional Humboldtian model (as a heritage of the former Czechoslovakia), inevitably combined with the Soviet model (infiltrated by Marxist ideology). It not only controlled the proportion of students belonging to the “working class” but also the content of study programmes (with great political pressure on favouring the humanities). Academics learned that obedience to the authorities was the best way to survive and gain promotion. The regulations set up by the Accreditation Commission ensure that the state of affairs remains unchanged.

3.2 Higher education and training

- 118th – Quality of education system;
- 105th – Quality of management schools.

This data from (Schwab, 2018) offer an additional indicator complementary to the university ranking. The quality of education suffers from underfinancing and a long-term neglected role of academic integrity in educators' development as well as their recognition. Gifted graduates do not seek jobs at universities due to low salaries and social status. The problems are not new. The majority of them were criticised by the European University Association report (Jensen et al., 2008) published a decade ago. Almost nothing has changed since then, despite the fact that there have been seven ministers in the post. In fact, the opposite seems to be true – education has a low priority for the Slovak government, and the seat is offered to the party and its representative who do not have the power to implement changes.

3.3 Labour-market efficiency

The data which influence policy decisions are the popularity of the institution, differences between ranked universities, factors that cannot be measured (e.g. learning outside the curriculum, campus diversity, activities, food, excellent teachers, emotional support, meeting people with the same interests). (Schwab, 2018) shows Slovakia in the last quartil in the following labor-market related indicators:

- 118th – Hiring and firing practices;
- 131st – Effect of taxation on incentives to work;
- 125th – Country's capacity to retain talent;
- 130th – Country's capacity to attract talent.

The labour-market policy drives many gifted individuals out of the country, although it is not an intentional strategy of the government or universities. It is demonstrated primarily in two directions. The first one is an exodus of gifted graduates – approximately on quarter of high school graduates leaves the country for their study abroad. The second one is the failure of the government to prefer experts' opinions – see Section 3.1.

3.4 Innovations

- 104th – Availability of scientists and engineers.

The number of graduates in the STEM fields (Science, Technology, Engineering and Mathematics) is low. There is little or no incentive to attract high-school graduates to undertake studies in these fields. The relevant incentives from the government and universities to prefer them absent.

4 Towards a Solution

Since the emergence of global rankings, universities have been unable to avoid national and international comparisons, which caused changes in the way universities function. We emphasise that higher-education policy decisions should not be based only on rankings data. A possible alternative for exploring tertiary education would be the benchmarking approach, which allows a comparison of institutions based on own needs (some of the ranking elements are included), such as the University Governance Screening Card Project that is used in 100 university networks in seven countries in the Middle East and North Africa (MENA). This tool

enables these institutions to measure themselves against international standards, define their own set of goals and establish benchmarks to assess progress in achieving them (CMI, 2015).

The above data show that economic power is not sufficient to place universities among the world's top ranks. It helps to allocate more finance to the system, but does not solve the complex problem. A systematic analysis was made by the European Association of Universities (Jensen et al, 2008) ten years ago.

Its final report suggests: *“Since the Slovak Higher Education system compares unfavorably to the already low European average with respect to research and innovation investments, the Slovak Republic should seek urgent action in redressing the imbalance rather than letting it grow even more.”* As we have seen, the government has only made minimal calls for changes. Pressure must come from the academic community. In accordance with this report, it should lead to:

- Providing opportunities for rewarding performance and initiative;
- Reducing the fragmentation of the research system both in terms of funding streams and structures;
- Fostering institutional alliances, networking and creating critical mass;
- Incentivising private investments in public research;
- Providing adequate competitive infrastructure for research;
- Facilitating collaboration between universities, industry and business;
- Inviting foreign specialist in order to enhance internationalisation of faculty and to implement global ethical standards.

The instruction to carry out the analysis was made by the Ministry of Education – and then totally neglected. If it had been immediately implemented, the sorry state of our tertiary-education system would most probably have been vastly improved by now. Violations of academic ethics, for example, are becoming more and more frequent these days. They are now attacking the highest university officials. Students witness this and move to foreign universities, primarily to the Czech Republic. Naturally, this bodes ill for the future of our university system.

The authors believe that improvement in the area discussed is not possible without dramatic and radical changes in society as a whole. Just as Martin Luther had doubts about the practice of indulgences – the pardoning of sins (Jones, 2012) – 502 years ago, so educators should start questioning the current situation in the academic world. If the country makes a concerted effort to fight corruption and unethical behaviour, the results will be reflected in academia as well. Today, the members of the younger generation inevitably complete their socialisation by learning, explicitly or implicitly, that corruption is “normal”. Some of the studies conducted in corrupt environments confirm that knowing that corruption is widespread often leads to its acceptance and increase (Corbacho et al. 2016).

We cannot expect that the academic world will remain an island of positive deviance in a corrupt, ruthless society. As the Communist regime has devastating consequences on the moral, we compared the percentage of the people who see corruption as the most critical

problem in their country in (Schwab, 2018) with the number of universities in the ARWU ranking (ARWU, 2018), in particular in first 500 and first 1000 positions. Table 3 shows the data. The countries are sorted by the growing percentage of the corruption awareness.

Table 3: Percentage of people considering the corruption as the most serious problem of the country and the number of universities in the Shanghai ranking

State	Corruption	ARWU 500	ARWU 1000
Poland	1.5	2	9
Estonia	2.2	1	2
Lithuania	4.6	0	1
Slovenia	5.4	1	2
Ukraine	5.4	0	1
Latvia	8	0	2
Czech Republic	9.6	1	12
Montenegro	10	0	0
Serbia	11.4	1	0
Bosnia and Herzegovina	11.5	0	0
Croatia	11.5	0	2
Romania	11.7	0	5
Hungary	14.9	0	7
Albania	16.4	0	0
Bulgaria	17.8	0	0
Slovak Republic	19.1	0	3
Moldova	20.7	0	0

Despite the fact that the figures in the column ARWU 500 decline, there is not a statistically relevant correlation. It does not mean that there is no relation between them. It may only indicate that the relationship is more complex.

The need for dramatic change is apparent in Slovakia. After killing of a young journalist, students started a movement against corruption. The unethical behaviour of politicians brought the masses to the streets, resulting in changes in the government in March 2018. The strong voice for ethics is making itself heard, and we have to be part of the crowd, the initiators of change, not just the recipients who enjoy the benefits of it.

Ethical behaviour courses offer an opportunity for a new value orientation. Such education ensures the training of both the teacher and the student, develops new technologies and conclusively allows a new vision, a new policy, a new market, new resources and a new system. The normative value of this kind of education is the emergence of a new humanity of responsible leaders driven by values and virtues and knowledgeable enough to transform their environment and serve the entire humanity in a new society yearning for ethical and fair-minded leaders.

Conclusions

The relationships are not straightforward. First, the comparison shows that several small former socialist countries are ranked even higher (Schwab, 2018) – and are still not represented among the top 500 universities in the Shanghai ranking. Azerbaijan is in 35th position in Global Competitiveness Report, Lithuania is 41st, Slovenia 48th, Bulgaria 49th, Latvia 54th and Kazakhstan 57th. This indicates that economic achievements alone are not

enough to achieve a top ranking in tertiary education. Further, especially in Western countries, there is panic about the influence of government policies on higher education (e.g. subsidies, budgeting, covering budget deficits or fill lecture rooms through overseas students). We are of the opinion that global university rankings have a lot to do with the invasion and spread of this panic. Davis (2016) stresses that *“ranking systems, are never objective.”*

Let us start our discussion on ethical issues with a quotation by (Macfarlane, 2004): *“Although the logic may seem strange, it has long been presumed that scholarly expertise alone is sufficient preparation to enable someone to teach effectively in higher education.”* In its narrow interpretation, the quotation points to the importance of various professional skills like problem solving, communication, proficiency in pedagogical approaches, ability to motivate students in a particular subject. Ethical leaders are individuals who act fairly and justly and are viewed as caring, honest and principled persons who make balanced decisions and who communicate the importance of ethics and ethical behaviour to their followers (Brown and Trevino, 2006).

In its wider interpretation (i.e. in the one presented here), it also includes educators' personal involvement in guiding students to higher achievements in both professional and ethical values. That's why the authors see their above considerations as a call for a wider research, possibly at an international level. The necessity to educate our next generation to ethics and academic value deserves it.

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Doctoral Workshop

Knowledge Management and Intellectual Capital: What frameworks from KM and IC are viable to measure competence?

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1. Extended Abstract

1.1. Purpose of research

Since intangible assets and intellectual capital have become a vital strategic asset in today's economy, the interest in measuring it have experienced a surge. As knowledge is referred to intangibles, this research will discuss different approaches to measure competence. Prior measurement methods only take financial measures into account, while the impact of intangibles is left out of account. The lack of measurement methods, respectively frameworks for measuring the correlation of KM activities and business performance constituted a new research field. In the beginning, it was researched for one final solution meeting any requirements to get valid performance data. This approach refers to the objectivism perspective and my research will show why a final solution is hard to find. Furthermore, the aim is to emphasize the importance of distinction of measurement approaches and to explain why the context, in which a measurement tool is used, is to consider and to provide a table of valuable frameworks to measure competence.

1.2. Major theoretical foundation

In order to understand, why knowledge has become an important asset in today's businesses, it is necessary to be aware of the resource-based view and knowledge-based view in Knowledge Management. The resource-based theory considers organizations as heterogeneous entities characterised by unique resource bases. These resource bases are increasingly composed of knowledge assets. The knowledge-based view characterizes knowledge as the principal source of economic rent. [3]

In Addition, the distinction between explicit and tacit knowledge is vital to consider. Explicit knowledge is formal, systematic and easy to express and therefore easy to transfer. By contrast, tacit knowledge is generated through own experiences and actions and hard to transfer. The uniqueness and originality of tacit knowledge is the reason, why organizations are desperate to create tacit knowledge. The aim is to enhance the organization's core competency, which is defined as "unique ability of organizations to deliver products or services, this ability is rather constant, is hard to copy by other organizations and is the basis for the benefit of the organization". [5]

Since there is a lack of a clear definition of the term competence, there is a vast number of attempts to find a coherent definition. The constructivist point of view allows a variety of competence definitions. The extent of the definition depends on the context in which it is

used. However, there is still no clear guideline how to define competence, still the constructivist perspective allows us to define and allocate an appropriate approach to measure intangible assets. [5] Nevertheless, there are three broad concepts dealing with the definition of competence. Competence can be regarded as a prerequisite, in order to be allowed to perform specific work. The second concept describes competence as an outcome, which means a performance compared to a set standard. The third one defines competence as the capability to perform, using knowledge and skills, on a particular work task. As this research examines the organizational context, the focus will be on the third concept. [4] For a better understanding of how intellectual capital (IC) can be measured, a definition is required. However, there is no consensus about the definition of IC, but a vast number of authors classified IC in human capital, organizational capital and customer capital. Considering the aim of this research, the focus is on organizational capital and human capital. [1] Human capital has its focus on the value that an individual can produce and can be subclassified into the employees' competence, relationship ability and values. Organizational capital has the intention to facilitate the functionality of human capital and consists of the supportive infrastructure. [2] In addition, there are three different views on organizational knowledge assets, namely positivistic view, interpretative view and organic view. The positivistic point of view (data as a knowledge) enables to determine economical value of an existing stock of knowledge assets and capture it in financial statements. The interpretative view of information as a knowledge-based asset examines the causal relationships between information and higher-level objectives. The organic view (knowledge as a resource) emphasizes the dynamic relational aspects of knowledge. [3]

1.3. Design/Methodology/Approach

Since the aim of this research is to provide viable frameworks to measure competence and to explain the different frameworks regarding measuring intangibles, a rapid structured literature review (RSLR) was conducted. The RSLR enables a search, covering a vast amount of relevant sources regarding a research domain. By reading relevant sources regarding the definition of competence and measurement methods, search-terms were determined and tipped in the Emerald Management Xtra database. The result page of the database provided 196 articles, which were quick-reviewed by reading the abstracts and eliminated if not relevant for the research question. The limitation of this research is due to the missing practical evidence, as this research domain is very immature.

1.4. Conclusion

The conclusion of this research is, that there is still a missing consensus about the concept of competence and IC. Many authors strove to find a coherent definition. The domain of KM is still young and has a great potential, as today's leading organizations acknowledge KM as an important strategic asset. In order to be able to set the right KM initiatives, it is necessary to develop tools to measure or value the stock of IA, which supports the organizations in

identifying opportunities, or whether an investment is lucrative or not. Traditional financial measurement methods fail to provide that information. The outcome of this paper is, that organizations should be aware of "what" they measure, even more importantly "why" they measure and in which context. The "why" is for different reasons important. One reason is to determine the goal of the measurement/valuation. Does an organization want to measure the performance, or value an opportunity? If a goal is defined, how detailed should the outcome of the activity be?

By knowing "why" an organization wants to conduct a measurement or valuation, the "what" has to be clarified. Many approaches ask the user of a tool to identify the intangibles to be measured. This is a long term learning process in every organization, as it is hard to reveal every single intangible asset of an organization. With greater experience of an organization, the effectiveness of the measurement increases too. The ability to use a tool effectively is also a factor, which increases the organizational competence.

1.5. Originality/value

This research provides a comprehensive overview about current existing methods to measure IC and competence. It also explains why to consider different aspects like context, measurement or valuation method, or which views are reasonable to consider in a given context. Furthermore, guidelines are provided of how to define an appropriate framework in order to get valid performance data.

1.6. Practical and research implications

As there is an everlasting search for a holistic framework/ approach to measure IC, existing frameworks can be extended. The difficulties in this research derive from the many approaches to define the term competence and what IC consists of. Additionally every industry has its own specific characteristics and requirements, which exacerbates the search for a coherent definition. This explains also why the context in which it is used, is as important as the "why" and the "what" in relation to measurement tools. In the concept of competence, the context has also a strong role, at least from a constructivist point of view. This view allows to search an adequate solution dependent on the context in which it is intended to be used. [23] Further research can be conducted to determine typical factors of every industry and having the greatest impact on the context. Nevertheless, it is important to note, even if it is possible to determine these factors, every organization's core competency is unique, which should also be regarded as an important attribute in the context. The question is, if it is possible to identify specific and typical factors of every industry known.

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Triple Loop Learning: A Rapid Structured Literature Review of its Conceptualizations and Practical Occurrence

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Abstract: To keep up with the competition, learning is essential for organizations. Despite the increasing number of literature reviews on the subject of organizational learning and especially the innovative concept of triple loop learning, it remains a problem to describe and define this topic clearly. By using the rapid structured literature review method, this work aims to clarify the conceptual confusion which the field is currently facing. Not only the theoretical approach of the topic triple loop learning is embedded in this work, but it also deals with the practical occurrence of the subject. In this context, necessary conditions and approaches to facilitate or enhance triple loop learning as well as the effects resulting from triple loop learning are analyzed and discussed. This paper constitutes an extensive foundation for further conceptual and empirical research as it presents the status quo of triple loop learning and provides important insights about it in practice.

Keywords: Triple loop learning, Organizational learning, Learning, Knowledge Management

1 Introduction

Over the last decade, the interest in organizational learning has grown significantly. The amount of published literature, books, journals as well as reviews about organizational learning has increased (Tosey et al. 2012). Today, organizational learning plays an undeniable and crucial role in organizations. The notion is, that in order to stay competitive, continuous learning is inevitable (Ameli and Kayes 2011). In the literature, the concept of organizational learning is divided into specific learning levels.

In the form of a rapid structured literature review, the following research question is analyzed within this work in order to provide a thorough investigation of triple loop learning and to assure a strong foundation for further conceptual as well as empirical research:

What are the conceptual foundations of triple loop learning and what characterizes its practical occurrence?

Among researchers there is a broad consistency when writing about the idea and concepts of the first two learning forms. However, contrary to those two terms, there is no concrete agreement in the literature on the definition of triple loop learning.

Some of the authors refer to it as new strategies and structures (Snell and Chak 1998) of learning while others write that it is an ethical behaviors process of learning (Ameli and Kayes 2011). Due to this conceptual confusion, the first part of this work deals with the classification of triple loop learning in the field of organizational learning. Because of the already existing classifications and the large number of different definitions for the term, this work will not add another categorization of triple loop learning but will show how the already existing research maps the field. Differences, patterns and similarities will be discussed to get a clear overview of the subject.

As triple loop learning is not only a theoretical concept, but also occurs in practice, the second part of the work includes the analysis of three practical foci of triple loop learning. In respect of the first focus, the aim is to find prerequisites that make the occurrence of triple loop learning possible. The second focus concentrates on approaches and methods, which enable, implement, facilitate or enhance triple loop learning and the third focus includes positive and negative effects resulting from it.

2 The field of organizational learning

Learning can be seen as a process that induces the individual to gain new knowledge, thereby changing its behavior and way of thinking (Stata and Almond 1989). Jensen (2005) describes learning as a phenomenon through which individuals gain new knowledge out of new information, whereas knowledge is the result of the information embedded in a specific context. If several individuals share insights as well as knowledge, organizational learning arises. To enable change in an organization, all members must learn together and share their visions and goals (Stata and Almond 1989). In the theoretical literature on organizational learning, a differentiation between learning levels is made. The most common distinction between these levels is into single and double loop learning (Ameli and Kayes 2011). Many authors have added a third level called triple loop learning (Tosey et al. 2012).

2.1 Single loop learning

Argyris and Schön (1974) define single loop learning as an approach to solve problems with a change of behavior without dealing with fundamental principles and purposes. Therefore, the aim of single loop learning is to simply identify the occurring problem to be able to provide an appropriate solution for it. Single loop learning hence just occurs in the behavioral dimension and can be seen as the least complex learning level of the three (Kwon and Nicolaidis 2017).

2.2 Double loop learning

The definition and explanation of double loop learning is also mostly referred to the work of Argyris and Schön (1974). It is a process that alters the rules or underlying values of the system that has caused the problem (Argyris and Schön 1974). It is also interpreted as “a total reframing of our cognitive schema, which could lead to fundamental changes in our behavior.”

(Kwon and Nicolaidis 2017, p. 88). Therefore, the behavioral changes resulting from double loop learning are stronger than those emerging from single loop learning because it requires a change in the cognitive framework (Kwon and Nicolaidis 2017).

2.3 Triple loop learning

Whereas authors share similar opinions on the conceptualizations and definitions of the two first learning levels, there are many different points of view concerning the phenomenon triple loop learning (Tosey et al. 2012). According to Kwon and Nicolaidis (2017) triple loop learning is a form that goes beyond single and double loop learning and aims for profound change. A lot of authors who write about triple loop learning refer the term to Argyris and Schön (1974). However, Tosey et al. (2012) state in their work that triple loop learning is just inspired by Argyris and Schön, but “no instance of the term appears in the text or index of any of Argyris and Schön’s joint or separate publications” (Tosey et al. 2012, p. 293). Based on this insight, Tosey et al. (2012, p. 293) categorize triple loop learning as follows:

- “A. a level beyond, and considered by proponents to be superior to, Argyris and Schön’s single-loop and double-loop learning;
- B. an equivalent to Argyris and Schön’s (1978, 1996) concept of ‘deuterolearning’;
- C. a proposed third level inspired by Bateson’s (1973) framework of levels of learning (specifically ‘Learning III’).”

Since the first part of this work aims to further investigate the conceptualizations of the notion of triple loop learning, this will no longer be discussed in depth.

3 Method

Because of the complexity due to the wide variety of literature concerning triple loop learning, a structured approach of research helps to work systematically and is necessary to provide a well structured and clear work. As this is the intention of this paper, this work follows the method called “Rapid Structured Literature Review” (RSLR) suggested by Armitage and Keeble-Allen (2008). This method is a compact version of the “Structured Literature Review” developed by Tranfield et al. (2003) and is more suitable for conducting smaller research projects by undergraduate and master’s degree students. Following the RSLR process three main stages have been conducted:

The first stage is called conceptualization. It involves the identification and justification of the research topic (Armitage and Keeble-Allen 2008). Organizational learning and its many different types of learning are becoming ever more important for organizations. As triple loop learning is a very complex learning form, it is necessary to deal with that subject in an organized way to get new insights and to provide a possibility to let this special form of learning happen. In order to provide a comprehensive, but not too broad overview of triple loop learning it is essential to specify the time frame the work should cover (Armitage and Keeble-Allen 2008). For answering the research question, papers from 1999 to 2018 are considered.

The second stage is called operational aspects and shows the actual research process (Armitage and Keeble-Allen 2008). The main databases used for the research are Proquest and Web of Science. By using certain keywords, the search generated a large amount of literature. To improve the research and to reduce the number of papers keywords were adopted and refined. In total, a scope of approximately 40 journals was scanned. After reading the abstracts, a framework including questions about the aims, findings and quality of the individual papers proved to be useful to keep an overview and consequently consider 14 papers as being useful for answering the research question. The considered literature was then arranged in two tables. Table A deals with the first part and Table B with the second part of the research question. Those tables serve as an overview of papers, which contain and analyze triple loop learning and in constitute a foundation for subsequent discussions on this matter. They are presented and described in the result section.

The third stage is called sense making. It is about answering the research question in the course of a discussion and interpretation of the considered references (Armitage and Keeble-Allen 2008). Therefore, useful information concerning triple loop learning is determined and subsequently the work describes why and how this information can be considered and processed. Additionally, the key lessons of the examined topic are presented. In the end, the findings of the RSLR are summarized and an outlook is given. Moreover, recommendations for further research are suggested (Armitage and Keeble-Allen 2008).

4 Results

Through the conducted RSLR multiple different literature sources, which are considered essential for answering the research question, were selected. Two tables have been developed to answer the two parts of the research question. The first one is: What are the conceptual foundations of triple loop learning? And the second one is: What characterizes its practical occurrence?

4.1 Table A

Table A of this work shows the conceptual foundations of triple loop learning in general. It shows a classification of selected literature that has already mapped the field of the topic organizational learning. The first column which is concerned with answering the research question is called "conceptual classification" and it reveals the different ways of categorization in the field of organizational learning in the papers. The next one is called "dichotomy of the field seen in" and refers to the different underlying viewpoints of the field of organizational learning. The next one focuses on the question if the authors even refer to triple loop learning in their classification. The last section of the table shows the different definitions of levels of learning.

Table A: classification of triple loop learning

Author(s)	Title	Publication year	Conceptual classification	Dichotomy of the field seen in	Reference to triple loop learning	Definitions of levels of learning
Helen Shipton	Cohesion or confusion? Towards a typology for organizational learning research	2006	The Four Quadrant Framework organizational learning the learning organization organizational knowledge knowledge management	Prescriptive, descriptive	no	individual organizational
Paul Tosey, Max Visser, Mark NK Saunders	The origins and conceptualizations of 'triple-loop' learning: A critical review	2012	Batesons' learning levels Argyrys and Schöns' levels Conceptualization A Conceptualization B Conceptualization C	action oriented, routine and incremental	yes	individual organizational
Linda Argote	Organizational learning research: Past, present and future	2011	Past, present, future	change in cognition or change in behavior	no	creating knowledge, retaining knowledge, transferring knowledge
Simonin Bernard	N-loop learning: part I – of hedgehog, fox, dodo bird and sphinx	2017	N-loop learning: N=0, N=1, N=2, N=3, N=4	NA	yes	single loop - double loop-, triple loop and higher loop learning
Victor J. Friedman Raanan Lipshitz, Micha Popper	The Mystification of Organizational Learning	2005		skeptics and visionaries	no	double loop learning, organizational learning
Marleen Huysman	Rethinking organizational learning: analyzing learning processes of information system designers	2000	4 biases 1. individual learning bias 2. active agency bias 3. the purposeful learning bias 4. the improvement bias	individual or organizational learning	no	individual learning, organizational learning

4.2 Table B

Table B presents papers which are considered important to contribute to the second part of the research question. Whereas the first three columns show some general information about the papers, author(s), title and publication year, the other three are important concerning the research question. The first one deals with the conditions enabling triple loop learning. The

second one contains different approaches related to triple loop learning and the last column shows effects the authors mention in their works

Table B: practical occurrence of triple loop learning

Author(s)	Title	Publication year	Condition(s) for triple loop learning	Approach related to triple loop learning	Effects
P.E. Jensen	A Contextual Theory of Learning and the Learning Organization	2005			unpredictable, drastic changes, psychological pain, conflicts, uncertainty, possibility for innovation
P. Tosey, M. Visser, M. NK Saunders	The origins and conceptualizations of "triple-loop" learning: A critical review	2012			risk, higher learning levels need not be more desirable than lower, unconscious occurrence
M.F. Peschl	Triple-loop learning as foundation for profound change, individual cultivation, and radical innovation. Construction processes beyond scientific and rational knowledge	2007	letting go existing patterns, attention to interior, patience	U-Theory	triple loop learning goes beyond rational knowledge, occurs on existential level, strong impact on emotions
C. Kwon, A. Nicolaidis	Managing Diversity Through Triple-Loop Learning: A Call for Paradigm Shift	2017	acceptation of possible failures and willingness to grow from them		
G.Romme, A.v. Witteloostuijn	Circular organizing and triple loop learning	1999	full participation, full information, willingness, need of structure	Circular Organization Design	
N. Rupcic	Challenges of the levels of learning	2018	commitment, tolerate failures, respect, openness, trust, reflection, honesty, patience	Kaiser's linking of past and future learning, CIPs	most fruitful level, demanding, new organizational processes, structures new strategic and organizational orientation
A. Kaiser	Learning from the future meets Bateson's levels of learning	2018		Ba	change on existential level, new goals and new alternatives, innovative ideas
P. Ameli, D.C. Kayes	Triple-loop learning in a cross-sector partnership, The DC Central Kitchen partnership	2011	long-term partnership, openness and willingness for experimentation, external partners		triple loop learning can improve collaboration for mutual learning

5 Discussion

The conducted RSLR resulted in many insights about triple loop learning. The following discussion based on an analysis and comparison of the selected key literature draws

conclusion and summarizes the main characteristics of research in the field of triple loop learning. The result tables make a substantial contribution for answering the research question. Whereas the first part of the discussion deals with the disagreement on the definitions of triple loop learning, the second part of the discussion deals with the occurrence of triple loop learning in practice including its conditions, approaches and effects.

5.1 Table A

5.1.1 Dichotomy of the field

The first column which aims at answering the research question is called "dichotomy of the field" and deals with all the different viewpoints that authors have in regard to the field of triple loop learning and its origins in the literature (Friedman et al. 2005; Tosey et al. 2012). The author's opinion of the prevailing conflict in the literature on this subject is fundamental to the subsequent classification.

The viewpoints of the papers listed are all named differently but still show similarities. For example, Shipton (2006) sees the conflict in prescriptive and explanatory classification. But actually, it is about whether learning takes place in the whole organization or in the individual. This classification is applied by all the authors listed in table A. Huysman (2000) labeled the conflict as "interactionist" or "social constructivist". Interactionist means that managers are told how organizations learn and pass on knowledge which can be interpreted as the organization learning from the individual. Social constructivist means that management theory strategies are applied to a company and therefore, the organization as a whole learns. The conflict can also be seen in just one of the two options, learning as an individual or learning as an organization (Huysman 2000). Argote (2011) divides the dichotomy into a change in cognition and a change in behavior. This means that organizational learning is seen in the process of change of knowledge within an organization rather than in the individual (Argote 2011). Sometimes the authors do not explicitly address this dichotomy but still write about it in some way. Simonin (2017) describes the levels with learning archetypes and their explanations show that the process of learning takes place in the whole organization regarding all levels. Furthermore, the distinction between skeptics or visionaries also relies on the difference between individual and organizational learning. The classification is about whether or not organizations can learn. Of course, the visionaries think that organizations can learn, and the skeptics believe that this is not possible. However, the viewpoints refer to the organization as the learning unit and not to the individual (Friedman et al. 2005).

5.1.2 Searching for triple loop learning and lower levels

Before the classification of organizational learning in terms of triple loop learning is discussed, it has to be examined if the papers refer to triple loop learning in any way. Some of the articles chosen for table A do not refer to triple loop learning when they map the field of organizational learning. But why do they not explicitly address triple loop learning when a literature review of organizational learning is conducted? They actually do, as it can still be seen that all of the papers analyzed refer to different levels of learning in a way, even if they describe it in other words, definitions or even with a metaphor.

Many scholars divide the levels of learning in their own way. They describe it as “sub-processes: creating, retaining and transferring knowledge” (Argote 2011, p. 440), or “double-loop learning, systems thinking, mental models, organizational memory, competency traps, dialogue” (Friedman et al. 2005, p. 25). Some authors refer to the simple distinction of organizational or individual learning like Huysman (2000) and Shipton (2006). However, consensus still can be found in this matter.

To explain these similarities, the levels of learning in the papers, which address triple loop learning have to be examined. Single and double loop learning are referred to Argyris and Schön (1974) by Tosey et al. (2012) and Simonin (2017). To find a clear definition and consensus among the articles about triple loop learning is not that easy. Most of the time, triple loop learning is referred to as a higher or even a deeper level as single and double loop learning, but whatever the first two levels are called, the third one is always related to the two lower levels in that particular way (Tosey et al. 2012). Furthermore, Tosey et al. (2012) have come up with the hypothesis that most of the literature refers triple loop learning to Argyris and Schön (1974) although they have never explicitly mentioned the term. Simonin (2017) refers to Yuthas et al. (2004, p. 239) who define triple loop learning as “the notion of continual reflection on the learning process, the contexts within which learning occurs, and the assumptions and values motivating the learning and influencing its outcomes”.

To sum this all up, it seems difficult to find the one explicit definition of triple loop learning. But it can be said that the similarity of the definitions is that triple loop learning goes beyond single and double loop learning and “it is a form of learning that has the potential to transform the very deepest parts in ourselves” (Kwon and Nicolaidis 2017, p. 90). Now, if the definitions of Argyris and Schön (1974) for single and double loop learning and the broad definition of Kwon and Nicolaidis (2017) are applied to the papers which do not explicitly use the term triple loop learning, it can be seen that all of them refer to three levels of learning, even if it is not in the same wording.

The term retaining knowledge is defined as the process of replicating methods without thinking of changing the underlying process of the method according to the situation (Argote 2012). This can be seen and interpreted as single loop learning because the stored knowledge is used to solve upcoming problems but nothing in the environment which caused the problem is changed. Also, Shipton (2006) refers to single loop learning and describes it as knowledge that is rooted in structures.

Double loop learning can also be found in the presented papers. Friedman et al. (2005), Simonin (2017) and Tosey et al. (2012) already label this level as double loop learning. But also, the concept of the term “transfer of knowledge” by Argote (2011) can be referred to this definition as it is described as changing the outcome of a process due to knowledge transfer (Argote 2012). Shipton (2006) writes about the organizational learning in the individual and how this level “involves making adjustments to internal functioning to accommodate perceived threats and opportunities presented by the external environment” (Shipton 2006, p. 241) which consequently can also be seen as double loop learning.

The term triple loop learning is either explicitly addressed or more hidden in the articles. Shipton (2006) describes her fourth quadrant of her typology when mapping the field as the part of knowledge that deals with tacit and explicit knowledge. Knowing is described as

“gradually and almost subconsciously absorbing understanding what is required to perform well, including the questions to ask, the language to use, how and where best to focus efforts” (Shipton 2006, p. 247). This can be seen as a form of triple loop learning. Furthermore, the description of the process of realizing the importance of tacit knowledge as a part of learning and the significant role of communities of practice to support that show that triple loop learning is definitely a part of the classification in Shipton’s (2006) work. In the work of Argote (2012), triple loop learning is not that easy to find at first glance. But if a closer look is taken at the term "creation" as a part of her theory of the learning curve, it can be seen that triple loop learning is meant. No precise definition of the notion is given, but it is described as the most discussed concept of the learning curve theory and as the most difficult to explain. “We know relatively more about knowledge transfer than we know about knowledge retention and creation in organizations so research on these latter processes would be especially useful.” (Argote 2012, p. 442). This view on triple loop learning is also shared by other authors. Furthermore, Tosey et al. (2012, p. 291) write that “we argue that conceptualizations of triple loop learning are diverse, often have little theoretical rooting, are sometimes driven by normative considerations, and lack support from empirical research.” and Simonin (2017) even invents a new notion, the N-loop learning, to create more clarity in the field of organizational learning and to inspire others to do more research on triple loop learning (Peschl, 2007). Another notion that can be counted to the generic term triple loop learning is reflection. The process of reflection is described as the ability to enable triple loop learning in an individual (Peschl, 2007). When Friedman et al. (2005) write about organizational learning, they describe the levels of learning with many different concepts. Among others, they use the terms reflection and knowledge creation, which have already been described and therefore can also be seen as an interpretation of triple loop learning.

As a result, it can be said that in all of the papers presented in table A, connections to triple loop learning can be found. It is not always easy to see them at first glance, due to the vast variety of different terms and explanations. However, triple loop learning is addressed in some way in the works and it can be seen that a great lack of consensus about the term exists but not about the definition itself.

5.1.3 The pattern behind the classifications

Based on the results of table A, two patterns can be derived according to how the literature is classified in relation to triple loop learning. The first one is the division by different viewpoints that have evolved over time, which is presented in the section 5.2. The second one is the categorization by definition of the term itself and is discussed in the section 5.3. The articles which categorize the field based on the different viewpoints are the ones by Shipton (2006) and Huysman (2000).

Shipton (2006) classifies the literature by using the method of a "crossquadrant" research whereas Huysman (2000) identifies biases. What they have in common is that they both chose four categories to map the field of organizational learning. Furthermore, if a closer look is taken, it can be seen that these categories correspond with each other. Quadrant one in the work of Shipton (2006) deals with the topic of how an individual learns within an organization. This can be compared to the first bias of the classification of Huysman (2000). This first bias is

concerned with the question of "who learns?" and is described with the fact that many authors identify the learning individual as the main factor to enable organizational learning (Huysman 2000). The second quadrant of Shipton (2006) relates to the second bias of the classification of Huysman (2000). They are both about the topic of how organizations learn from the individual. In more detail, this classification deals with the process of transferring knowledge from one person to the whole organization. The third quadrant and also the third bias are both about the creation, transfer and storage of knowledge or in other words how an organization learns. The last ones also equal each other in their classification. They equal with why organizations learn and can be interpreted as triple loop learning in both works (Shipton 2006; Huysman 2000). To conclude, it can be said that four streams of the field of organizational learning can be recognized when triple loop learning is conceptualized.

1. The individual learning within an organization
2. The organization learning from the individual
3. How an organization learns in terms of creating knowledge, transferring and storing it
4. Triple loop learning in organizations

The second categorization of the literature refers to the different terms of triple loop learning prevailing in the field. This classification is the most common one but with this said it is also the most confusing one. In contrast to the classification by streams and viewpoints, this classification adds new terms to the field with every new scholar. The authors try to invent new notions like Simonin (2017) or try to refer the new terms to already existing ones like Tosey et al. (2012). Friedman et al. (2005) invented a name just for the confusion and called it mystification. Although all of these authors state that the field is currently facing confusion and lack of a consensus about organizational learning and especially triple loop learning, nevertheless, they keep adding new classifications to the field.

Due to the confusion of the origin of the term, adding new ones but not agreeing on a terminology leads to an increasing confusion. A simpler classification is presented in the work of Argote (2011). The literature is divided into the past, present and the future. It represents the existing literature in an organized manner and shows that the development of the field can be reconstructed. Furthermore, it represents what has already been researched in the past. This could be a way to leave the past behind and give the whole field of organizational learning a glimpse into the future and not into the past.

By looking at the papers and analyzing them, it can be seen that the definitions and classifications are not as different from each other as it looks at first. If it can be recognized that there are not many differences but many similarities, the past and present can be accepted as they are, and the future can be open to new research.

5.2 Table B

5.2.1 Enabling conditions

To enable triple loop learning Peschl (2007) finds it essential to let go already existing thought processes and cognitive patterns. The individual must create a welcoming atmosphere, where

a high degree of attention and receptiveness is possible. For this process patience is inevitable. Individuals need to wait for the right time when new patterns and knowledge are ready to emerge to lead to individual growth.

Romme and Witteloostuijn (1999) mention several prerequisites for the emergence of triple loop learning. For the authors, such a drastic change always depends on the participation and willingness of an organization's members. In addition, free access to all information considered important is inevitable. In order to achieve triple loop learning, Romme and van Witteloostuijn (1999) describe that it is absolutely necessary that organizations possess a structure, which facilitates learning.

Rupcic's (2018) paper presented in table B especially focuses on conditions that enable higher-order learning. Rupcic (2018) claims that triple loop learning can only be achieved if all involved entities respect each other, are open minded towards new and show commitment. Moreover, triple loop learning requires systemic thinking, which means considering the whole system and to take interdependencies into account. To achieve triple loop learning, individuals and organizations have to stand failures and must be well disposed towards potential challenges. According to Rupcic (2018), critical reflection, patience, trust and honesty are necessary factors for enabling triple loop learning.

Kwon and Nicolaidis (2017) also emphasize the importance of accepting possible failures when triple loop learning happens. In addition, it is even more important to be willed to grow from those failures.

Ameli and Kayes (2011) claim that triple loop learning can only be achieved through the interaction of two organizations. The authors emphasize that triple loop learning can only be achieved when one organization learns from the process of the partner's organization about practices, structures or culture. Therefore, the condition is at least one additional organization and the consideration of its culture, its strategies and its routines. Consequently, triple loop learning can be achieved more easily in a long-term partnership between two or more organizations. Furthermore, Ameli and Kayes (2011) emphasize the willingness to experiment.

To conclude, it can be said that there are several conditions for triple loop learning. In general, the mentioned conditions of the researched literature correspond with each other, which suggests that there are basic prerequisites. Those are willingness and openness towards a new learning level and experimentation. Therewith associated individuals and organizations also have to be willed to face upcoming challenges and to accept potentially emerging failures and mistakes as well as to be able to grow from them. Some authors even emphasize that there is a need to let go of old patterns in order to be receptive for new ones. Furthermore, one can say that individuals and organizations involved in a triple loop learning process must possess a large degree on stamina and patience. As triple loop learning is demanding, an essential factor is complete dedication of all involved individuals and organizations. Within organizations as well as within interorganizational learning, mutual trust, respect and honesty are important for building a strong foundation to achieve triple loop learning.

5.2.2 Approaches related to triple loop learning

One can distinguish between approaches facilitating triple loop learning, methods that describe how triple loop learning can be implemented and approaches to enhance this special learning form.

Romme and Witteloostuijn (1999) present a special organizational structure called the circular organization model which tends to enable and facilitate triple loop learning in the field of decision-making and participation within an organization. The design is characterized by individual circles embedded in the traditional hierarchy of an organization. The circular organization constitutes an infrastructure enabling and facilitating single-, double- and triple loop learning. Whereas single loop learning deals with the question whether things are done right and considers simple error detection without a change in norms and policies, double loop learning is about the error detection with changing norms and policies and considers the question, whether the right things are done. Triple loop learning in this case is enabled through the question if people have the opportunity to make well informed choices in a process of managing issues, especially regarding their competences. These competences are developed through linking together all units of learning in one overall learning infrastructure, the circular organization.

For implementing triple loop learning consciously, Peschl (2007) proposes a framework called U-theory, which functions as follows: The first step is to detect already existing established thought processes and cognitive patterns and to develop an attitude for allowing new impressions. It is important to shift the focus away from already established solutions towards openness for new patterns and knowledge. If this part of the process is successfully completed, the phase of presencing can start. The individual is open and is ready for new emerging knowledge. The last stage of the U-theory deals with the emergence of new knowledge and patterns. Individuals have to be patient and need to wait for the right time when new patterns and knowledge are ready to emerge to lead to individual growth. When the time has come, it is essential to grasp and verify the emerged knowledge. Therefore, it is necessary to save it through routines and actions. After doing so, it is necessary to implement and integrate the emerged patterns and knowledge in daily business situations.

Kaiser (2018) proposes an approach to enhance triple loop learning. He ties together two sources of learning – learning from the past and learning from the future – in order to enlarge the potential of triple loop learning. Therefore, he connects the learning levels provided by Bateson (1972), as sources of learning from the past, with a relatively modern source - learning from the future. Kaiser (2018) emphasizes that both have the potential of knowledge creation and a connection of them results in even more innovative ideas. Whereas many learning theories base themselves on learning from the past such as Bateson (1972), the second learning source is considered as noticeably less investigated. The idea behind learning from the future is to give up old experiences and to learn from the envisioned future (Kaiser 2018). For realizing the learning levels including Learning III, Kaiser (2018) proposes the concept of Ba as a helpful method. A Ba can be seen as a space of interpretation and interaction. The concept of Ba supports the different learning modes and therefore can help organizations to create new knowledge and innovative ideas and solutions (Kaiser 2018). Also, Rupcic (2018) suggests considering learning from the future as an approach to enhance higher order learning forms.

Ameli and Kayes (2011) claim that triple loop learning is enabled through the approach of an interorganizational learning process. Organizations can influence each other's strategies and values and consequently cause a change within the partners organizations. This interorganizational process can enable triple loop learning, as it is seen as a learning level that involves changes in organizations due to the interaction between them. Within the process between those organizations, triple loop learning can occur when organizations work with partners and triggers changes in the partners organizational culture and in turn allows changes in the own organization triggered by the partners values, strategies and cultures.

To sum up, the distinct approaches of triple loop learning are very difficult to compare due to three reasons. The authors suggest and examine the distinct approaches in different fields. Moreover, the approaches are related to triple loop learning in different ways (enabling, facilitating, improving). Furthermore, the approaches base on different points of view on triple loop learning.

5.2.3 Effects resulting from triple loop learning

Jensen (2005) emphasizes that triple loop learning does not follow a specific process and is very inconsistent, that is why it is not possible to predict the results. This situation of uncertainty often leads to innovation and new ways of thinking and acting. On the other side, triple loop learning entails drastic changes within individuals and causes psychological pain. In addition, in many cases conflicts emerge because of the total recreation of routines and norms. Those conflicts do not have to be destructive, rather they can constitute constructive conflicts and are seen as the starting point for the organization's development and progress.

Tosey et al. (2012) include the argument that higher levels of learning, such as triple loop learning stand for more complexity due to the interrelation between all learning levels and a higher risk. The authors also emphasize that higher learning levels do not have to be more desirable than lower ones. One of the three conceptualizations described by Tosey et al. (2012) equates triple loop learning with Bateson's (1972) Learning III who claims that Learning III cannot be implemented consciously, Learning III just happens. This, however, cannot be confirmed in the approaches, such as for example the U-theory suggested by Peschl (2007), where triple loop learning is consciously implemented. Peschl (2007) points out that triple loop learning is really challenging and has strong impacts on the emotions as it touches the existential level and the deepest parts of individuals.

Rupcic (2018) describes the outcome of higher order learning as changes in behavior and memory, whereas those changes can result in new processes structures or even new strategic organizational orientations. The author emphasizes that triple loop learning is the most fruitful learning level as it results in new insights, a better understanding of failures and builds the foundation for acting in the future. At the same time Rupcic (2018) points out that triple loop learning is the most demanding level as it is very complex - on an organizational level even more than on an individual's level.

For Kaiser (2018), triple loop learning can result in new goals and subsequently new alternatives to reach them, especially when linking together learning from the past and learning from the future. Triple loop learning can then lead to more innovative and sustainable ideas.

Ameli and Kayes (2011), who examined triple loop learning as an interorganizational learning phenomenon emphasize that triple loop learning has the power to improve the collaboration for mutual learning as it emerges when organizations learn from each other's practices, structures and culture.

To sum up, the authors mention several effects of triple loop learning. Many emphasize that triple loop learning is a very demanding and risky learning form that results in drastic changes. As changes deriving from triple loop learning happen on the most profound, existential level, triple loop learning has a strong impact on the personality and the emotions. Some authors even claim that triple loop learning cannot be achieved without psychological pain. Although the drastic changes sometimes pose a risk for individuals and organizations, they usually lead to positive, innovative results. It is the situation of uncertainty caused by triple loop learning from which new ways of action emerge because of new possible interpretations. Authors that consider triple loop learning as emerging out of the interaction of at least two organizations emphasize that a great benefit is the improvement of cooperation and collaboration between the organizations as members can gain new insights, new point of views and an exchange of information and experiences with other organizations.

6 Conclusion

In this work, the two parts "what are the conceptual foundations of triple loop learning" and " what characterizes its practical occurrence " of the research questions were examined. First, the conceptualizations of the term triple loop learning have been analyzed. Second, this work investigated the occurrence of triple loop learning in practice on the basis of three focus points: conditions enabling triple loop learning, approaches related to triple loop learning and effects and outcomes. Using the method of a rapid structured literature review, two tables including the papers considered important for answering the research question were generated.

Table A firstly deals with the literature which classifies the field of organizational learning by looking at the coherence of organizational and individual learning and secondly with the literature which invents new terms and notions to detangle the theoretical confusion. However, the latter contributes to the fact that even more confusion than defining is happening. The RSLR on this part of the research question showed that even if authors do not label the third learning level as triple loop learning they do write about it. Therefore, a consistency of the meaning of the terms single, double and triple loop learning could be determined. For further research in the field of organizational learning, it is not important to add another term about triple loop learning to the field but to invest in empirical work of triple loop learning and see how the problem of defining triple loop learning solves itself.

In regard of the second part of the research question, summarizing, triple loop learning is able to occur when the involved participants show openness and willingness for it and in addition are able to tolerate potentially emerging failures. It requires patience and commitment of all participants. Within the course of this paper several approaches linked to triple loop learning occurred. Some of them enable triple loop learning, others present processes how to implement it and the purpose of some is the enhancement of triple loop learning. In addition, effects and outcomes of triple loop learning were carved out. The work showed that triple

loop learning triggers drastic changes. Although it is a possibility that the process leads to failures and psychological pain, it can also be very beneficial and result in innovative ideas, new routines, processes and orientations. In conclusion, through this thesis, it can be seen that triple loop learning is a very helpful learning form, nonetheless its dangers should not be underestimated. Triple loop learning enables a high level of innovation, which becomes more and more important for organizations to distinguish themselves from others. A question which remains unanswered is whether triple loop learning can be implemented deliberately or if it just occurs unconsciously. The authors do not agree on this point. Therefore, further research should consider this question. Due to the lack of empirical work, future empirical research is needed to carve out lessons learned in order to be able to develop further tools and approaches for organizations to enable or implement triple loop learning.

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Education and Human Resource Development

Are Massive Open Online Courses More Effective than Traditional Classrooms?

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Abstract: Massive open online courses (MOOCs) have become one of the most prominent trends in higher education. In contrast to a traditional classroom where knowledge is delivered through face-to-face interaction, MOOC offers open-access, video-based instructional content, and forums which are released through an online platform to unlimited number of learners. Despite impressive notable features, its effectiveness has yet to be proven. Intrigued with the issue, the objective of this study is to decipher the effectiveness of learning via MOOCs in blended learning and traditional classrooms on academic achievements. An experimental study was employed with non-equivalent pre-test and post-test control group design among sixty undergraduate accounting students from a Malaysian university. The students were divided into two groups; experimental (learning via MOOCs in blended learning) and control (traditional classroom). Results of paired sample T-test indicated that there were significant differences on academic achievements between the pre-test and post-test for both groups. However, the magnitude of effect of the former was higher than the latter. Results of MANOVA indicated that there were significant differences on academic achievements between groups for post-test, but not in the pre-test. The discoveries provide useful insights for educational fraternities on technological and pedagogical aspects of how teaching can best be delivered.

Keywords: academic, achievements, massive open online course, online learning, traditional classrooms

1 Introduction

The acceleration of Information Communication and Technology (ICT) has dynamically changed the landscape of tertiary education which replaces a classroom from face-to-face teaching to deliver entirely over the internet. The classroom has started to lose its monopoly as the place of teaching and learning (Nguyen, 2015). As of now, the quality and capacity of online delivery has been tremendously evolved and emerged in varieties of forms (Weller, 2014). Many researchers and educators are interested on online delivery due to varieties of

attributes that can be applied to make instructions more interesting to learners. Massive open online courses (MOOCs) are a recent innovation of online delivery or pedagogical tool which has drawn great attention from both public and academic fraternities.

MOOCs are open to everyone with web accessibility and for the time-being they are offered without charging any fee. These open online courses are set up by third party as independent online platforms, and educators are encouraged to develop and upload their teaching materials through MOOCs. The courses support lifelong learning and are able to cater for high volume of learners. They offer incomparable classroom experience by developing an effective learning engagement (Baturay 2014). This is done through displaying the multimedia material extensively on an interface screen and conducted through interactive mode. The presence of these digital courses continues to grow in higher education, as many learners are eager and feel excited to learn with the technology. To date, thousands of courses have been invented via MOOCs that have attracted millions of learners all over the world.

According to Olazabalaga et al. (2016), MOOCs have prevalently become one of the most prominent trends in higher education since they were created in 2008. The demand for online educational platforms coupled with the ubiquitous medium of information delivery means has made MOOC as one of the popular innovative and viable pedagogical tool applications on the web. Although MOOCs have been supported and favoured by all sectors of society, many still dispel and wary of their effectiveness in delivering educational content because in reality, there are various challenges and threats that would hamper their success (Zheng and Yang 2017).

To date, abundance of research has been conducted to elicit the effectiveness of online learning over traditional classroom on student's learning outcomes. Some studies found significant positive effects (Bowen and Ithaka 2012; Deterding et al. 2011; Lack 2013; Kapp 2012), some found there were no significant effects (McCutheon et al., 2015; Means et al. 2010), while some indicated mixed or negative effects (Figlio, et al. 2010; Xu and Jagers 2013). However, it is noted that most of the afore-mentioned studies have investigated the effectiveness of MOOCs as one of online pedagogical and technological tools over traditional classroom teaching in relation to learning outcomes. Scarce studies were found examining MOOCs with regard to academic achievements.

Academic achievements indicate how well students perform in relation to a course or program, whilst learning outcomes are knowledge and skills that students acquire after completion of course or program. Both academic achievements and learning outcomes are of equally important pedagogical tools to assess the effectiveness of student's learning. As abundance of studies have focussed on learning outcomes, this study is motivated to bridge the gap in which its objective is to decipher the effectiveness of learning via MOOCs in blended learning and traditional classrooms on academic achievements.

The following section will review prior literatures in relation to the variables of interest which are the bases of hypothesis developments. It is then followed by the description of the methodology used in data collection. The upcoming sections then highlight discussions,

theoretical and managerial implications as well as limitations of the study. Finally, the last section summarizes the entire study.

2 Literature Review

2.1 Massive Open Online Courses (MOOCs) and Blended Learning

Blended learning is a mode of learning that combines online learning and traditional face-to-face interactions. MOOCs can be delivered either entirely over the internet or through blended learning. Blended and purely online learning have always been classified in a similar mode by prior studies that is online learning (Nguyen 2015). According to Bilington and Fronmeller (2014), MOOCs present greater challenges of high-quality interaction compared to other learning modes. These modes of learning are preferable due to their effectiveness in educating learners, enhancing professional development and providing world class education to everyone with internet connection (Koller et al. 2014; Lorenzetti 2013).

Traditional classrooms emphasize face-to-face interactions, whereby teaching and learning are centred on educators. Online learning, on the other hand, provides opportunity for learners to learn in a virtual classroom. The role of teaching and learning is shifted from educators to learners. Although online learning offers a more learner-friendly approach, the learners must struggle on their own without educator's guidance (Zawacki-Richter et al. 2018). Blended learning on the other hand, takes the best features of those two modes, apart from embracing technology, it upholds human connections.

2.2 Traditional classrooms

Traditional classrooms refer to physical "brick and mortar" classrooms, in which knowledge is delivered through face-to-face interactions between an educator and learners. Markers and whiteboards are important teaching tools used to impart knowledge. However, due to the advent of knowledge economy, the traditional classrooms have started to lose their monopoly as the place of learning. To date, the internet has made significant changes to almost all spheres of teaching and learning (Nguyen 2015).

As of now, many studies have been conducted to examine effects of online learning over traditional classrooms in relation to learning outcomes and results have indicated mixed findings (Bowen and Ithaka 2012; Deterding et al. 2011; Feeley and Parris 2012; Figlio et al. 2010; Kapp 2012; Lack 2013; McCutcheon et al. 2015; Means et al. 2010; Nguyen 2015; Xu and Jagers 2013).

McCutcheon et al. (2015) compared the effects of a clinical skill course between online learning and traditional classrooms on learning outcomes among undergraduate nursing students. They found that both modes namely online learning and traditional classrooms did not have any significant effects with learning outcomes.

Nguyen (2015) did a meta-analysis on 92 studies eliciting the effectiveness of online teaching over traditional classroom in relation to learning outcomes. He found that 92% of the studies indicated that online learnings were more effective than traditional classrooms. Only 3% of the compiled studies showed the reverse, that traditional classrooms were more effective than online learning, while the remaining 4 % indicated mixed findings.

Harandi (2015) examined the effect of online learning on motivation to learn among 140 students in one of Tehran universities. The results indicated that online learnings were more likely to motivate students to learn. The students were more likely to be engaged with technology and successfully achieved the learning outcomes.

Lack (2013) conducted a meta-analysis on 30 studies that investigated the effect of online learnings over traditional classrooms on learning outcomes. She found that the studies showed mixed findings. Some studies revealed that students who learned via online learning were more likely to perform better. On the other hand, there were studies that indicated reversed results since students who learned through online teaching were less likely to perform better learning outcomes as opposed to those who learned in traditional classrooms. Meanwhile, there were also studies that showed no significant effects between those two learning modes. She concluded that the studies did not provide conclusive outcomes as to whether online learning was effective than traditional classrooms with regard to learning outcomes.

Bowen and Ithaka (2012) conducted an experimental study by dividing students into two groups. The first group was taught via online through blended learning in which the online teaching was delivered in a classroom, known as an experimental group. Students in this group met once a week and they did most of the work online. The second group was assigned to a traditional classroom known as a control group. This group learned in a classroom through face-to-face interactions. The study found that the students who learn through blended learning were more likely to obtain better learning outcomes than the students who learned in the traditional classroom.

Feeley (2012) examined the effect of an online pedagogical tool namely PeerWise, over a traditional classroom in relation to learning outcomes. The study was conducted on a course taken by undergraduate political science students using a mixed-method approach. They found that students who used the online tool were more likely to have better learning outcomes than those who learned in the traditional classroom. Moreover, the students in the former mode were more motivated and enthusiast to learn as opposed to the students in the latter mode.

Figlio et al. (2010) investigated the effect of online learning versus traditional classrooms in relation to learning outcomes through an experimental study by grouping students into two groups with different modes of learning. Students for both learning modes were given similar supplemental materials and instructions. They discovered that only the traditional classroom was more likely to have positive effects on learning outcome. Additionally, they found one possible and very likely significant internal validity threat which was treatment diffusion for the 'live-only' students since everybody could look at the online lectures using a friend's

account. Educators also cannot monitor whether the students focus and pay attention on teaching deliveries as they were conducted in a virtual classroom.

Means et al. (2010) conducted a meta-analysis research from 1996 to 2008 on more than a thousand empirical studies of online learning. They compared online learning with traditional classrooms in relation to students' learning outcomes. Based on analyses, they found that students who learned through online learning were more likely to perform modestly better than those in traditional classrooms. Moreover, the analyses indicated that the difference in learning outcomes was higher in studies where online learning was blended with face-to-face interactions.

Despite that many studies showed online learning was more effective than traditional classrooms on learning outcomes (Bowen and Ithaka 2012; Deterding et al. 2011; Feeley 2012; Kapp 2012; Lack 2013; Nguyen 2015;), there were also studies that indicated no significant effects between those variables (McCutcheon et al. 2015; Means et al. 2010). Yet, there were studies that indicated negative or mixed findings; either traditional classrooms were more effective than online learning or both learning modes had significant effects on learning outcomes (Figlio et al. 2010; Rush and Yin 2010; Xu and Jagers 2013).

Findings from previous studies provided inconclusive outcomes but intertwining paths that researchers and educators can ponder at this juncture as related to academic achievements. Which modes, either online learning, traditional classrooms or both have significant effects on academic achievement? After reviewing the afore-mentioned literatures, the following four hypotheses are formulated.

H1: There is a significant effect between the pre-test and post-test of experimental group's academic achievements (who learned via MOOC in blended learning).

H2: There is a significant effect between the pre-test and post-test of control group's academic achievements (who learned in a traditional classroom).

H3: There is no significant difference in the pre-test academic achievements between experimental and control groups.

H4: There is a significant difference in the post-test academic achievements between experimental and control groups.

3 Methodology

The study employed an experimental method with non-equivalent pre-test and post-test control group design in which the hypotheses were tested by using inferential statistics. Respondents of this study were sixty final year accounting students from one Malaysian university. The selection of students in any of the two groups was done by the system. This was to ensure that there was no selection bias in grouping the respondents.

Integrated case study was chosen in examining the effectiveness of learning via MOOC in blended learning over traditional classroom because it was the only final course for degree in accounting program that can be learned via MOOC. This course was developed and uploaded online by educators in 2018. The course emphasises on complex case studies by integrating knowledge from various disciplines. Students are required to solve and analyse the cases by applying higher order thinking skills. For this research purposes, the course was delivered by the educator to learners in two learning modes. The experimental group learned via MOOC in blended learning (teaching via MOOCs in a traditional classroom) while the control group learned in a traditional classroom in which learnings were heavily relied on face-to-face interactions.

Two instruments were used for this study namely pre-test and post-test. Both groups were required to sit for a pre-test (O) prior to treatment process. The respondents were given a test on a palm oil and rainforest case study of 2 pages-length with 4 main questions. The maximum and minimum scores were 50 and 0 respectively, whereby marks would be awarded on appropriate answers given by the respondents. Allocation time for the pre-test was an hour. After completing the pre-test, both groups were given treatments. The experimental group was treated with MOOC (X_1) in blended learning while the control group was treated with traditional classroom (TC) (X_2). To ensure that the delivering adopted a purely MOOC in blended learning or traditional classroom, the researcher explained the respondents on the meaning of MOOC in blended learning and traditional classroom modes, methods, scopes, schedules and duration of sessions before delivering started.

The Integrated Case Study course was delivered to EG and CG in the same scopes, schedules and durations. Both modes had the same lesson plans and learning outcomes for each session. To ensure that MOOC in blended learning and traditional classroom was properly performed, the sessions were monitored by a checklist. The checklist contains 16 items that describe the situation or behaviour of an educator when handling the teaching and learning sessions. The researcher was required to indicate either "yes" or "no" to each item based on the situation or what was usually done by the educator. This was important to ensure that there was no bias against MOOC in blended learning or traditional classroom. The sessions were conducted for 4 hours in a week for a period of one month, totalling to 16 hours of delivering sessions. As the test only covered one case, the period of delivering for 4 hours per week was deemed appropriate.

After completing the treatment of X_1 and X_2 in a month period, both groups were required to sit for a post-test (O1). They were given the same questions with similar assessments. Data or scores obtained by the students were compared to examine any significant effects between pre-test and post-test.

The data were analysed by multivariate of MANOVA and paired sample t-test. These two tests were carried out to examine whether there was a significant effect in academic achievements (pre-test and post-test) before and after the treatment was given for EG and CG. In the context of this study, the results or scores obtained by the students would represent their academic achievements. During the test sessions, the researchers were assured that all respondents

were in good health and fit to answer. They were placed in a comfortable and conducive surrounding with no disruptions. Table 1 depicts the research design.

Table 1: Research design

	Pre-test	Treatment	Post-test	<i>Note.</i> O = Pre-
Experimental group	O	X ₁	O ₁	
Control group	O	X ₂	O ₁	

test Experimental Group (EG) / Control Group (CG),

X₁= Treatment (the course was delivered via MOOCs in blended learning)

X₂ = Treatment (the course was delivered in a traditional classroom)

O₁ = Post-test Experimental Group (EG) / Control Group (CG).

The scores for pre-test and post-test of a case study were analysed using paired samples T-test and multivariate analysis of variance (MANOVA). The paired samples T-test was used to test whether there were significant differences in the scores obtained by the experimental or control group. On the other hand, the MANOVA was used to test whether there were significant differences between marks obtained by the experimental and control groups. Hypotheses 1 and 2 would be tested by paired samples T-test while MANOVA test was employed for hypotheses 3 and 4 testing.

4 Results

4.1 Normality Test

To ensure that data were within normal distribution, a Shapiro-Wilk test was carried out on pre-test and post-test for experimental group (EG) and control group (CG). Results showed that pre-test and post-test scores of respondent's academic achievements for EG were 0.26 and 0.34 respectively (the academic achievements were based on the integrated case study scores obtained by every student) while pre-test and post-test scores for CG were 0.33 and 0.34 respectively, indicating that the data were within normal distribution.

4.2 Reliability Analysis

A reliability test is conducted to examine whether a measuring instrument consistently represents the items it is measuring (Sekaran and Bougie 2010). Results of Kuder Richardson (KR 20) of pre-test and post-test reliability Cronbach alpha indicated that EG obtained 0.88 and 0.75 respectively, while CG attained 0.73 and 0.70 respectively. All values were greater than 0.7 as recommended by Sekaran and Bougie (2010) in which the instruments were consistent in representing the measured items. According to Nunally (1978), the values indicate that the data are reliable for further analysis.

4.3 Hypotheses Testing

4.3.1 Effect of MOOCs and Traditional Classroom on Academic Achievements

The first hypothesis states that there is a significant effect between the pre-test and post-test of experimental group (EG)'s academic achievements (who learned via MOOCs in blended learning). The EG's mean scores for pre-test and post-test were 20.33 and 42.43 respectively, while the standard deviations for pre-test and post-test were 1.68 and 1.86 respectively. Results of paired samples T-test supported hypothesis 1 which indicated that there was a significant effect in the academic achievement scores for the EG between the pre-test and post-test ($t = 28.89, p < 0.05$). Table 2 depicts the results of paired samples T-test for experimental group who was treated with MOOCs in blended learning.

Table 2: Paired samples T-test within the experimental group who was treated with MOOCs in blended learning

Test	No. of respondents	Means	Standard deviation	t value	Significant
Pre-test	30	20.33	1.68	28.89	0.000***
Post-test	30	42.27	1.86		

* $p < 0.05$, t value is greater than 1.96 ** $p < 0.01$, t value is greater than 2.33 *** $p < 0.00$, t value is greater than 2.58

The second hypothesis states that there is a significant effect the between pre-test and post-test of control group's academic achievements (who learned in a traditional classroom). Results indicated that the academic achievement mean scores for pre-test and post-test were 21.37 and 32.27, while the standard deviations were 1.98 and 1.83 for pre-test and post-test respectively. The results of paired samples T-test supported hypothesis two and indicated that there was a significant effect in the academic achievement mean scores obtained by the CG between pre-test and post-test ($t = 8.34, p < 0.05$). Table 3 depicts the paired samples T-test for the control group who learned in a traditional classroom.

Table 3: Paired samples T-test within the control group who learned in a traditional classroom

Test	No. of respondents	Means	Standard deviation	t value	Significant
Pre-test	30	21.37	1.98	8.34	0.000***
Post-test	30	31.23	1.83		

* $p < 0.05$, t value is greater than 1.96 ** $p < 0.01$, t value is greater than 2.33 *** $p < 0.00$, t value is greater than 2.58.

The third hypothesis proposes that there is no significant difference in the pre-test academic achievements between experimental and control groups (before being treated with MOOC in blended learning and traditional classrooms). Multivariate analysis of variance (MANOVA) was adopted to test the hypothesis by comparing the academic achievement mean scores of experimental and control groups, followed by testing whether the scores were significantly different from one to another.

Results of MANOVA indicated that the academic achievement scores obtained by EG and CG were 20.33 and 21.37 respectively. The results further indicated that the t -value was 0.07, ($p > 0.05$), indicating that there was no significant difference in the academic achievement mean scores between the groups; thus, hypothesis 3 is supported. This showed that both groups consist of students with equal level of academic achievements before the treatment was given, which is a pre-requisite for experimental study criteria. Table 4 depicts the MANOVA results for pre-test academic achievements for EG and CG before being treated with MOOC in a blended learning and traditional classroom.

Table 4: MANOVA results for pre-test academic achievements

between experimental and control groups

Group	No. of respondents	Means	Standard deviation	t value	Significant
EG	30	20.33	1.04	0.07	0.933
CG	30	21.37	1.15		

$p < 0.05$, t value is greater than 1.96 ** $p < 0.01$, t value is greater than 2.33 *** $p < 0.00$, t value is greater than 2.58

The fourth hypothesis postulates that there is a significant effect in the post-test academic achievements between EG and CG. Results showed that the mean scores for EG and CG were 42.27 and 31.23. The results supported hypothesis 4 that there is a significant difference in the academic achievement mean score between the two groups ($t = 508.85$, $p < 0.05$). Table 5 depicts the results of MANOVA on post-test academic achievements between groups.

Table 5: MANOVA results for post-test academic achievements between

experimental and control groups

Group	No. of respondents	Means	Standard deviation	t-value	Significant
EG	30	42.27	1.89	42.85	0.000***
CG	30	31.23	1.57		

$p < 0.05$, t value is greater than 1.96 ** $p < 0.01$, t value is greater than 2.33 *** $p < 0.00$, t value is greater than 2.58

5 Discussion

The first research objective is to examine whether there is a significant effect between the pre-test and post-test of experimental group's academic achievements who learns via MOOC in blended learning. Results indicated that there was a significant effect in pre-test and post-test mean scores of the academic achievements within the experimental group ($t = 28.89$, $p < 0.05$, $n=30$). The results are in tandem with prior studies (Bowen and Ithaka 2012; Deterding et al. 2011; Feeley 2012; Kapp 2012; Lack 2013; Nguyen 2015;) that examined them in relation

to learning outcomes, in which online blended learning also had a significant effect on academic achievements.

The second research objective is to examine whether there is a significant effect between the pre-test and post-test of control group's academic achievements (students who learn in traditional classrooms). Results indicated that there was a significant effect between pre-test and post-test mean scores for the control group's academic achievements ($t = 13.34, p < 0.05, n = 30$). The results were likely to be consistent with the work of Xu and Jagers (2013), and Figlio et al. (2010) which indicated that traditional classroom does have a significant effect on students' learning outcomes.

The third research objective is to examine whether there is no significant difference in the pre-test mean scores of the academic achievements between experimental and control groups. Results supported the hypothesis in which it indicated that there was no significant difference in the mean scores of the academic achievements between the two groups ($t = 0.007, p < 0.05$). In other words, the results indicated that both groups (before being treated via MOOC in blended learning and traditional classroom) had equalled level of academic achievements. The results fulfilled the experimental study criteria of the respondent's homogeneity in which members in the two groups should possess an equal level of knowledge before they were given treatments.

The fourth research objective is to examine whether there is a significant difference in the post-test academic achievements between experimental and control groups. Results showed that the post-test mean scores for experimental and control groups were 42.27 and 42.85 respectively. The results supported hypothesis 4 in which it indicated that there is significant difference in the academic achievement mean scores between groups ($t = 508.85, p < 0.05$). The results concurred with the prior studies (Bowen and Ithaka 2013; Feeley, 2010; Kapp 2012; Lack 2013) who indicated that the learning outcomes/academic achievement for respondents who learned via MOOCs in blended learning was significantly difference from those who learned in the traditional classroom.

5.1 Implication to academic

This study contributes to the existing body of pedagogical literature on the importance of blending a MOOC in a traditional taught course. Although totally relying on online learning is cost effective, it impedes social interactions between educators, learners and peers. A combination of online learning and traditional classroom is the best pedagogical approach not only to accelerate academic achievements, but also to harness soft skills. The skills can only be acquired through personal interactions which are essential for one to succeed in the workplace.

This study also provides an implication that in blended learning, the burden of learning is shifted from educators to learners. MOOCs provide a platform to facilitate communication between the educators and the learners, and enable them to share learning materials. Learners have opportunities to learn in virtual classrooms. They are motivated to be engaged and take responsibility for what they are learning and possibility to learn at their own pace.

These would increase confidence as they are able to learn to use new tools and handle more complex tasks through supports and capabilities provided by technology.

The study also provides implication that blended learning requires both academic fraternities namely educators and learners to be computer literacy and technology acceptance. Indeed, technology is important to increase knowledge retention, reduce stress related to adopting big amount of content and assist learners to face the challenges in the advent of digital and technology era.

5.2 Implication to management

The study provides implications to management as to aggressively support MOOCs through blended learning in various forms. Blended learning is a good fit in academic setting as it takes the best out of the two worlds. Online learning offers open-access, video-based instructional content, problem sets and forums and cater unlimited number of learners, while traditional classroom provides face-to-face interactions. On one hand, it accommodates different learning needs and a well-designed delivery styles and preferences, while on the other hand, face-to-face deliveries are becoming useful in solving complex and personal issues that are unable to resolve by technology.

This study provides implications to management as to increase investments in human and technology resources by formulating policy, strategy and action plans for the diffusion, implementation and sustainability of online courses. Academicians who agree to be involved in the development of online courses should be given incentives by recognizing their efforts. This can be done in the form of alleviation of other duties such as lecturing time, marking, research and administrative duties amongst others.

5.3 Limitation of the study

A few limitations are acknowledged after the study was carried out. The first limitation notified is that some of the respondents requested others to complete their online assignments. As a result, they may not be able to follow all the self-guidance teaching materials which could affect their understanding on the course. This would affect their scores on the post-test. However, the number of the respondents was minimal and did not affect the validity of the whole result.

Another limitation identified is that this study was conducted in a quantitative mode, whereby the participants were required to answer a case study in two tests namely pre-test and post-test. They could not freely express their views and highlight the problems encountered while learning via MOOCs in blended learning and traditional classrooms. This limits the in-depth understanding of the problem that should be unleashed. To overcome this methodological issue, future studies are suggested to be conducted in a qualitative mode. The qualitative

analysis enables the exploring of the problems from the students, parents, teachers and policy makers education point of views. Hence, the issues can be analysed in a more comprehensive and holistic manner that may contribute for a betterment.

6 Conclusion

The study found that both modes namely learning via MOOCs in blended learning and traditional classrooms had positive effects on academic achievements. However, the magnitude of effects of the former was higher than the latter. MOOCs are pedagogical innovations that will change traditional learning idea and provide a new way for acquiring knowledge to meet the competency demands of a digital, knowledge driven society. Despite that online learning is highly preferred by those who are technology driven and offers learners the opportunity to learn in virtual environment, it hinders social interactions between people. The interactions are essential to harness soft skills needed to connect with people and make them successful in the real world. This contrasts with the traditional classroom in which the delivery is heavily relied on face-to-face interactions. Blending MOOC with traditional classroom in a taught course would give the best of these two pedagogical approaches in which it impetuses learners' interests in learning, increases motivation and self-esteem, accelerates understanding as well as connects people; individual and worldwide. Hence, it is hoped that MOOC through blended learning would prepare students for the future and be agile to meet the challenges in relation to the vibration of technologies and thus elevate them to achieve the highest academic achievements.

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Introduction of e-Learning Environments at European Higher Education Area (EHEA) Universities

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Abstract: The introduction of e-learning environments at universities causes a paradigm shift in university systems across Europe in terms of teaching and learning practices. The European Higher Education Area (EHEA) comprises various types of higher education approaches such as Universities of Applied Sciences, Grandes Ecoles, and traditional universities and come out of different academic traditions.

These traditions cause differences in terms of how teaching and learning take place. There are three distinct types of universities: those adhering to the Humboldtian, the French or the Anglo-Saxon tradition. Academic staff is research staff and while professors are expected to share their research results with students, they are not 'teaching' in the classic sense.

The introduction of e-learning environments acts as game changer in the EHEA as it requires a new approach to presenting research findings and interaction between students and academic staff. A lot of attention has been given to technological challenges, little to cultural, pedagogic or didactic ones.

Further comparative research could bring about findings about how to consider stakeholder backgrounds when implementing e-learning elements and environments in higher education.

Keywords: EHEA, e-learning, change management, didactics, university traditions

1 Introduction

New forms of computer mediated teaching and learning are at the center of attention at many universities throughout Europe. Administrators and academic staff have to hone new competences in terms of technology and pedagogy when delivering contents online. Students have to re-learn how to learn within and with e-learning environments. The key challenges at universities and other institutions of higher learning center around "...faculty development, organizational change, innovative practices and new institutional models, effectiveness of teaching and learning activities, the student experience, increasing success for all students, and state and provincial policies, strategies, and funding models." (Gasevic et al. 2015)

The role of teaching within a higher education setting is in itself an issue of culture. Institutions that adhere to the Anglo-Saxon tradition assign a higher importance to teaching and community outreach (Marino and Lo Presti, 2018, p.735), whereas institutions in the

Humboldtian tradition emphasize the importance of universities as places of research that are detached from the community and in which ‘research and teaching are mutual prerequisites’ (Karlsohn, 2014, p.2). Throughout the last century, universities in Europe varied in terms of standards, procedures, staffing, degree structures and academic freedom. Such differences stood in stark contrast to the socio-economic requirements of the European Union, which needs a more supranational work force. In order to alleviate these educational inequalities, the countries embarked on the so-called Bologna process, a process that aims to create a European Higher Education Area (EHEA) to make room for an educational system that enables international cooperation and transparency. (Biggs and Tang, 2011)

The paper in hand looks at the framework in which lecturers are expected to work with and within these structures. To this end, interviews were conducted at the University of New Caledonia with academic staff, students, the university’s instructional design team and administrators. The interview statements were compared to findings published in relevant publications.

In order to evaluate the situation on site against the findings in the relevant literature, a set of guided interview questions was prepared. User interviews with academic staff, instructional designers, student representatives and administrators were carried out in the interviewees’ native language, French, on campus between March and June of 2018. In this approach, the guidelines for a qualitative analysis according to Mayring (2016) have been respected. The interviews were processed with software for qualitative data analysis, MaxQDA; all statements were coded, analyzed and evaluated.

2 E-learning - machine-mediated knowledge delivery

Various forms of machine-mediated knowledge transfer are commonly referred to as e-learning. Sangrà et al (2012) aligned e-learning definitions along four categories: 1) technology-driven, 2) delivery-system-oriented, 3) communication-oriented, and 4) educational-paradigm-oriented definitions.

The educational-paradigm-oriented definitions are of interest as this category defines e-learning as an *improvement* on an existing educational paradigm. This attitude may be due to the fact that the majority of authors who write about e-learning work in education. Some examples of these definitions include the following.

“E-learning is the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services, as well as remote exchange and collaboration” (Alonso et al. 2005).

“E-learning is a broad combination of processes, content, and infrastructure to use computers and networks to scale and/or improve one or more significant parts of a learning value chain, including management and delivery” (Aldrich, 2005).

“E-learning is defined as information and communication technologies used to support students to improve their learning” (Ellis, Ginns, and Piggott, 2009)

“E-learning refers to educational processes that utilize information and communications technology to mediate synchronous as well as asynchronous learning and teaching activities.” (Jereb and Šmitek, 2006)

The term ‘e-learning’ allows to differentiate between two key dimensions that e-learning integrates and combines: the first being online/offline learning, with synchronous/asynchronous communication, and the second being independent/collaborative learning. (Fenouillet and Déro, 2006). (Malingré, 2013)

Nowadays, “...university students have, in large measure, grown up with technology; they socialize, book vacations, bank, and shop through the web. ...While students may prefer to utilize technology to connect, communicate, and manage their lives, they may or may not have the requisite skills for success in technology-mediated and e-learning environments.”(Salyers et al 2014)

E-learning can thus be seen as logical development in a modern knowledge society and knowledge delivery systems such as universities are in a position where they respond to sociological developments.

3 Types of university systems and their missions

“Higher education institutions are categorized along three models. All three models are of European origin: The Humboldtian, the French or Napoleonic, and the Anglo-Saxon model. These higher education models were spread around the world during the colonial period ... and have remained influential on the current higher education, although they, to some extent, have been modified or contextualized to fit an individual country’s higher education system.”(Sam and van der Sijde, 2014).

The Humboldtian university system, the French system and the Anglo-Saxon system each have peculiarities that impact the introduction of e-learning elements and e-learning environments in the various educational settings as they each have different expectations towards their academic staff.

Anglo-Saxon universities are self-governing institutions that hone autonomous academic disciplines, whereas the Humboldtian and Napoleonic models of universities are state-run. The Anglo-Saxon model is at the source of the two-cycle degree program of undergraduate (Bachelor’s) and postgraduate study (Master’s and PhD). However, Humboldtian and French universities have adopted this two-cycle program with the introduction of the Bologna process. (Sam and Sijde, 2014)

3.1 Humboldtian university system

The Humboldtian university system is characterized by a “unity of research and teaching (‘Einheit von Forschung und Lehre’), solitude or autonomy and freedom (‘Einsamkeit und Freiheit’). A third notion the Humboldtian system holds high is that of ‘Bildung’, edification, and self-formation. Indeed, it was Humboldt’s main concern to challenge the attempt to subject universities to demands put forward by politicians and professional guilds and organizations. (Feher, 2001)

‘Bildung’ means education on an intellectual level that is not primarily geared towards the acquisition of skills that serve any defined labor market. Humboldt is credited with developing the concept of academic freedom, the basis of free research and free expression of ideas. In the Humboldtian framework, learning takes place in this context of intellectual exchange. Attaining skills for a defined labor market is of lower order importance. Professors at institutions that adhere to the Humboldtian ideal see themselves primarily as researchers and not as teachers. The Humboldtian notion of higher education is prevalent throughout central Europe. (Josephson, Karlsohn, Östling, 2014)

3.2 The French or Napoleonic university system

The French or Napoleonic university system’s roots are rather different from the Humboldtian ideal. “The form that the French university has taken since its re-establishment under Napoleon at the beginning of the nineteenth century [is] a centralized, hierarchical, and total system of education that encompassed secondary schooling ... it is impossible, in France, to dissociate the history of the university from its relationship with the state from which it emanates, and upon which it so closely depends... (Picard, 2012)

The French university system grants its staff much of the same intellectual freedom as the Humboldtian system. In the French system, research is the key activity of its staff; teaching plays a minor role and professors are not required to have any that would facilitate introducing e-learning environments. “In the French model ... higher education institutions are regarded as public entities ... it is a highly centralized system ... organized and directed by the government ... [the French university system] relies on rote learning rather than research and independent thinking.” Gellert (1993b) claims that this model emphasizes high-level vocational skills, and professional education, and it is thus basically known as a “training model”. (Sam and van der Sijde, 2014)

3.3 The Anglo-Saxon university system

The Anglo-Saxon model goes back to the nineteenth century, notably to Oxford and Cambridge, emphasizes personality development through a so-called ‘liberal education’ that relies on close ties between the academic staff and students.

Anglo-Saxon style universities are institutionally autonomous and are free to define the type of courses they offer, the personnel they recruit, and the objectives they follow. This in turn leads to a more company-style management and effectiveness in terms of budget and staff.

“The attractiveness of the Anglo Saxon model ... lies in the following of its features:

The focus on the immediate needs of employers;

The ability to translate these needs into curricula and assessment processes;

The removal of the need to incorporate ‘surplus’ requirements into vocational curricula;

The ease of construction of qualifications suited to the particular needs of employers;

The aptness for the assessment of prior learning in informal and non-formal contexts;

The capacity for rapid response to changes in employer needs;

The use of a learning outcomes approach, allowing for the ‘reverse engineering’ of curricula and pedagogies. “(Clarke and Winch, 2015)

3.4 The impact of the university systems on learning

The Anglo-Saxon, the French and the Humboldtian-oriented universities face similar challenges when it comes to the introduction of e-learning components and environments. The introduction of e-learning always entails pedagogical, technological, economic and cultural challenges to the stakeholders affected by it.

Ali et al. (2018) identify 68 factors that impact the introduction of e-learning environments; they group these factors along *technological issues, individual challenges, problems associated with pedagogy* of e-learning and topics related to *administration*.

While the authors, identified many individual barriers including: prior knowledge, computer anxiety, social loafing, awareness and attitude towards ICT, student’s support, student’s individual culture, computer literacy (Ali, 2018, p.169), they did not consider the learning tradition in which academic staff is expected to adopt new approaches to knowledge transfer; instead, the authors already speak of ‘teaching’ without taking into account that there are higher education environments, in which teaching is not a primary concern for the academic staff.

Academic staff is put in a new position that requires of them not only the academic skills for which they were hired but also a set of technological, pedagogic and didactic skills most staff are not trained in.

Many universities have begun to hire so-called instructional designers to support academic staff in realizing meaningful e-learning settings by taking contents and learning goals and processing them for online delivery.

4. E-learning as game changer to the university system

As early as 1998, Paul Wildman pins down key aspects for a meaningful teaching and learning framework in a ubiquitous learning environment. In his article in the “American Behavioral Scientist”, he notes that setting up an e-learning environment required “a team process in its design, operation and evaluation” (Wildman, 1998). Although Wildman’s article is 20 years old, it has lost little of its timeliness as many e-learning environment developments still face the issues he spelled out back in 1998.

The introduction of e-learning environments puts academic staff in a position where they have to work in teams to prepare lectures. But they were trained to focus on their research, especially in the Humboldtian and the French model, but also – albeit to a lesser degree – in the Anglo-Saxon model. This shift in requirements deserves closer research in order to evaluate its impact on the type of learning output in higher education.

According to Wildman, there are four strategically significant areas in course development: Authoring the curriculum, technical considerations (web design), instructional design and learning design coupled with content delivery (Wildman, 1998). University professors traditionally have been involved in curriculum development, but unless it is their area of expertise, they are strangers to web design, instructional design and didactics.

How does one find the proper equilibrium between what is technically feasible, the degree to which a facilitator wants to interact with learners and to balance interaction (between people) and interactivity (between people and electronic resources). What Wildman called ‘elsewhere learning’ has become ubiquitous learning. ‘It is time- and place- Independent and interactive.’ (Wildman, 1998)

Within this framework, academic staff can experience a loss of ownership, which impacts university education as a whole in that academic staff is put in a position where they have to divert resources away from their research and towards issues of pedagogy and didactics in order to respond to emerging needs of a knowledge society.

4.1 Theoretical factors impacting the development of e-learning environments

The advancement of the knowledge society has been followed up by broader political will to promoting any development that democratizes education on all levels. Over the past two decades, Internet technologies and social networks have reached the education sector and lead to a democratization of knowledge distribution.

Traditional universities are now faced with committing themselves to the increasing democratization of knowledge on an institutional, departmental and personnel level; this means the university as a whole needs to decide whether or not to open itself up to a broader public, the departments need to respond to a clientele with a more diverse background than would be expected from a traditional student population and academic staff is required to respond to the structural shifts associated to e-learning.

To put highly qualified researchers into a position where they are expected to be highly qualified teachers is a serious challenge to the culture of the various systems and its stakeholders on the macro, meso and micro level of learning as a whole and e-learning in particular.

“To assess the cultural challenges [Azer and El-Sherbini suggest to] ask: Who has access to education? Who has access to technology? How are students taught? What’s the role of the instructor? What educational resources are available? What is ‘cheating’? How do students prefer to learn? How do students regard instructors or professors? What are the language challenges? What learning technologies are available, or not? How important are promptness and schedules? In what language does education take place? What is the motivation to succeed in university? What types of activities do learners prefer reading, role playing?” (Azer and El-Sherbini, 2011)

4.2 Good practice example

The University of New Caledonia serves as example for an institution that introduces e-learning because it is a remote university and stands to gain broader influence within the system and the region when introducing e-learning. Situated in an ultra-peripheral region of the European Union in the South Pacific, it upholds all standards of European universities, is financed by the French government and it is part of the Erasmus exchange network.

In line with the overall digitization strategy French universities have been made subject to by the French government, the University of New Caledonia is in the process of digitizing many of its support services and course contents. Students access administrative information and schedules in the so-called ENT (Espace Numérique du Travail), course contents and activities via the platform Moodle.

4.3 Change management and knowledge management in higher education

The French university system has a long-standing tradition, yet, it has undergone several waves of serious change since the late 1960s. The introduction of e-learning is just another element that is brought upon an academic staff that is primarily valued for their accomplishments in research.

The administration at the University of New Caledonia therefore chose not to *force* its academic staff to engage in machine-mediated content delivery. Instead, the administration provides support for academic staff to make the incorporation of e-learning elements attractive. Courses can be conceptualized and structured in cooperation with professional instructional designers who have a background in pedagogy and are trained in creating audio-visual material.

The concern for creating high quality e-learning offers is not a cosmetic one. In order to respect the local culture and the basic demand of students for teachers to be physically present, courses have to be structured to maximize the social aspect of learning.

Since there is a unique situation at the University of New Caledonia in which the instructional design team picked up work in 2018, it would be interesting to add a quantitative research into how many academic staff currently engage in e-learning and how many will do so in two years time and in four years time; including data like years of service of the academic staff, type of online element and number of students reached with the offers in order to see to what degree the support of the instructional design team is used.

5 Results and Conclusion

With the introduction of e-learning, one also needs to give pedagogical aspects of teaching and learning an overhaul. Changing the mode of contents delivery changes the mode of learning. (Wildman, 1998; Gasevic et al. 2015)

Knowledge management, change management and organizational theories offer approaches that can help institutions of higher education to facilitate the change from traditional teaching and learning settings to pluridimensional knowledge transfer environments. (Spector, 2002; Stark et al. 2013)

Institutions of higher education across the world implement e-learning environments in order to benefit from the advantages such environments entail, such as asynchronous, ubiquitous learning and the access to new client groups. (Guri-Rosenblit, 2009)

Depending on their intellectual tradition and the maturity level of any e-learning environment, challenges in the introduction of e-learning vary. In a traditionalist setting such as a French or Humboldtian university system, the system caters to full-time students who are educated in a very controlled environment by a academic staff whose primary professional obligation and interest focuses on research rather than teaching and who enjoys a great deal of autonomy regarding any teaching activity.

The main challenges connected with the introduction of e-learning at universities, however, surface on the meso-level of university departments and on the micro-level of how to organize individual courses to best benefit from the advantages of any digital resource that is made available to academic staff and students.

Common issues in the introduction of e-learning environments in institutions of higher education can be summarized as follows: Institutions need to understand that the introduction of e-learning means a paradigm change. Institutions that promote digitization are advised to focus on training both their administrative and their academic staff in order to optimally handle the ins and outs of any software purchased and used to this end. (Brown, 2014)

Institutions should be clear about *why and how* they introduce e-learning and be aware of their expectations towards e-learning. This can be facilitated by working with e-learning maturity models. Such models can support the structured approach to the introductory process. (Marshall, 2010)

On a department level, administrative and academic staff have an interest in deciding to what extent contents taught in the various programs is superimposable so as to condense efforts and avoid redundancy. This also facilitates collaboration between the instructors and promotes structural unity. Academic staff, although experts in their respective fields, are not experts in teaching and even to a lesser degree in e-learning. The introduction of e-learning environments that facilitate knowledge transfer and development requires academic staff to produce materials suitable for the preferred mode of teaching. (Ali et al. 2018)

The material has to be prepared to best support the underlying teaching concept any instructor is trying to realize. Blended learning, inverted classroom or pure distance education each pose different challenges in terms of course preparation, and all e-learning concepts require a different approach from traditional face-to-face instruction. (Potive et al. 2014)

Students *and* academic staff need to be made familiar with e-learning settings. Each learning management system has its idiosyncrasies and institutions of higher education can positively impact success rates by providing proper introduction and guidance both in terms of how to handle a specific learning management system and in terms of the selected underlying pedagogic principle as early as possible in the student's university life. (Iskander, 2012, Marshall, 2010)

Institutions of higher education should be aware of the degree of human interaction that is required in order to keep up the spirits of both the academic staff and the students. Guri-Rosenblit (2009) states; "Not only students in campus universities, but also students in distance teaching institutions express a high demand for personal interaction with academics and other students. One of the main lessons derived...in the last thirty years underlines the importance of social interaction in learning/teaching processes." (Guri-Rosenblit, 2009)

In order to identify common issues in the introduction of e-learning environments, it is first necessary to define what e-learning and e-learning environments are. It is also illuminating to look at universities and their various intellectual traditions and how these traditions can impact change and change management processes as a whole. (Picard, 2012; Josephson, et al., 2014)

The University of New Caledonia is clear about having to commit to investing into digitization both in terms of technology and pedagogy. Thus, the university decided to invest into its e-learning future so as to provide the best possible framework in which academic staff can develop e-learning elements for their respective courses and this support is available to all instructors, regardless of their academic specialty. (personal communication)

The team also works on best practice examples that can entice new instructors to experiment with e-learning elements. The fact that the instructional design team centrally manages the e-learning platform Moodle ensures structural unity and coherence. (personal communication)

To this end, it was helpful to identify knowledge management theories and their impact on teaching in higher education and e-learning maturity models that can support the structuring introductory processes and ongoing quality management of e-learning programs at universities.

A closer look at theoretical factors impacting the development of e-learning environments allows administrators, academic staff and students to be aware of strengths, weaknesses, opportunities and threats in the introduction of e-learning environments. (McIver, 2016)

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Quality of Mutual Human-machine Learning processes in Smart Factories

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Abstract: Smart factories emerged as a result of industrial revolution and/or evolution in the context of Industry 4.0. These have brought about revolution in manufacturing, which is called intelligent manufacturing. In intelligent production systems human and machine not only successfully interact with each other, but also they learn from each other using the cognitive skills of both actors. Mutual human-machine learning enables enhancement of human and machines and can enable fundamental potentials within systems. In order to assess the outcome of mutual learning process the term “quality of mutual learning” and its determinants are defined. Summary of findings indicate that machines can deliver remarkable performance examined distinctively and relatively to humans, except that human can lead machine in undertaking complex and diverse tasks.

Keywords: Quality Assessment, Human-machine interaction, Reciprocal learning, Machine learning process, Smart factory

1 Introduction

In the new era of evolution, development and innovation in industrial automation technology, which is assisted on the one hand by Internet and on the other hand by human-machine interaction known as Industry 4.0, industries and production sectors face challenges and complexities in market due to structural changes caused by global trends (Bartodziej 2016; Bauernhansl et al. 2014). Thus, it is demanded that these new modern technologies bring about and implement potentials in processes and procedures within manufacturing sectors (Bartodziej 2016). Internet aids industrial sector by Internet of Things (IoT), which is bringing Internet to the things that leads to creation of services to be utilized by humans and machines (Shaoshuai et al. 2011). It is discussable that the future belongs not only to humans or machines but only to human and machine together (Ganschar et al. 2013).

Industry 4.0 comprises a shift from simply automated to an intelligent manufacturing concept and indicates the growth of physical and virtual worlds together (Klocke et al. 2011). In other words, it is the transformation of industry towards full digitalization and intelligentization particularly in manufacturing processes. The concepts such as IoT, smart manufacturing, and other technological developments function as a backbone of Industry 4.0 to integrate human and machine agents, production and processes (Erol et al. 2016). Industry 4.0 underlies the main research question in this paper, which concerns learning process by human and machines and evaluates its quality.

Machine learning capabilities indicated huge development in the computing era, whereas it is required to build a new generation and application of computers, which learn from structured and unstructured data, capture and analyze vital correlations, and propose measurements to achieve better outcomes (Kelly and Hamm 2013). As a matter of this fact, Ansari et al. (2018a) discussed the assistance of human resource by devices, likewise human and machine interaction and information exchange with intelligent machines enforce changes to work division between human and machine as a matter of Industry 4.0. Intelligent collaboration of humans and machines, in which the behavioural characteristics of humans affect algorithms adopted by machines and vice versa can deliver better results, as the strengths of both agents are extracted (Vempaty et al. 2018).

1.1 Research Objective

To aforementioned challenges, intense and coordinated research will be promoted aimed at developing technological and methodological solutions. The main aim of the research is to assess and facilitate the human-machine reciprocal learning in the recently mentioned industrial evolution and/or revolution and to bring about anticipated outcomes for manufacturing sectors with assistance of a quality assessment of the whole process. Due to the mentioned industrial evolution and/or revolution new roles and tasks will be appointed within Human-centered CPPS; these will lead to more complexed problem-solving processes to be mastered.

As a result of the industrial evolution and/or revolution, there are the cognitive skills of machines to be discussed. As mentioned above, to implement a concept for quality assessment of the mutual learning interaction, skills of humans and machines will be investigated and identified. Furthermore, the collaboration of these elements will be a basis for the concept, respective various quality aspects that are defined and quantified. An important factor is to understand, how humans and machines assist each other and accordingly, respectively better solution and outcomes will be brought about.

Two types of learners will be distinguished as follows: human or intelligent machine. The collaboration of these two actors in the process of learning introduce the process of mutual human-machine learning. The outcome of this process and its effects on each actor of the process (human or machine) will be discussed. It is significant to find the relations of key attributes to learning process. Therefore, attributes will be designated to this process; at final stage can be amalgamated as a whole.

Beyond the human-machine mutual learning as the main objectives of the proposed research the central aim is to assess the quality of the process, explicitly to construct the mentioned model to be utilized further in industrial production sectors and applicable to smart factories. This model will aid the actors within the CPPS to identify the most applicable approach to learn from each other. The model will lead to better understanding of task allocation in the process of production and to reach more comprehensive outcomes within the system. Due to this reason, this assessment model is centered as the fundamental aim of the proposed research.

1.2 Methodology and outline of paper

As the main methodology for the proposed research, a comprehensive literature review will be conducted to generate the state-of-art of the mutual human-machine learning in context of Industry 4.0 and smart factory. The methodology consists of respective literature that are found employing database search using keywords. Section 2 provides detailed state-of-art literature review methodology used in this study. Based on the comprehensive literature review and summarizing the findings of the review, it is intended to apply the outcomes and construct respective quantitative and/or qualitative models in section 3. The outcome will be evaluating the learning process depending on defined attributes, enhancing labour division between human and machine, setting a basis to improve the mutual learning process. Section 4 contains findings, conclusion and future outlook.

2 Literature Review

Smart Factory is one of the aforementioned potentials that is constructed by connected and flexible integrated production infrastructure and has as its core Cyber-Physical Systems (CPS) (Geisberger and Broy 2012; Bauernhansl et al. 2014). It is future of production intended by Industry 4.0 as node of bigger network that is connected in order to ease the process of fulfilling of certain customer demands (Erol et al. 2016). It can organize itself with aid of CPS in real-time because of real-time data, to which it has access and with these data it can adjoin virtual and real world in order to find real-time solutions (Bauernhansl et al. 2014). The goal is to create a technology platform to be adapted in various industries (before any in medicine sector) and practical tool to change (Kelly and Hamm 2013).

Lee (2008) defined CPS as “integrations of computation and physical processes. Embedded computers and networks monitor and control the physical processes, usually with feedback loops where physical processes affect computations and vice versa.” Cognitive computing enable machines and systems to resemble the ability of human learning to reproduce human skills assisted by methods of machine learning (Ansari et al. 2018a). The more humans interact with and train these machines, the smarter they will get and train back and as a feedback this loop continues and cause reciprocal learning (Kelly and Hamm 2013). These interconnected systems emerged by exponential growth of computing and dynamic progression of information and communication technology (Bartodziej 2016).

Although Humans play vital role in these systems, CPS can construct digitalized networks and optimise themselves and they can autonomously solve problems with human cooperation (Bauernhansl et al. 2014). Machines are once designed, programmed and trained by humans, further on they can reprogram themselves as well as they interact and learn (Kelly and Hamm 2013). CPPS (Cyber-Physical Production Systems) are subdivisions for CPS that are mainly in direct connection with production systems in order to increase the productivity and flexibility in manufacturing (Reinhart et al., 2013). Despite discussions on human substitutability, Ansari and Seidenberg (2016) emphasize of complementarity of strengths and weaknesses of CPPS and human regarding of knowledge exchange and reciprocal learning.

An attempt to identify strategies to execute an ideal state of smart factory distinguishes various approaches to construct collaboration of highly autonomous CPPS and qualified humans (Ansari and Seidenberg 2016). The goal is having machines that are more capable of learning and interacting with humans, which leads to a state that humans think and work differently, since machines can give helpful insights aided by weighing and assessing evidence and drawing relevant conclusions (Kelly and Hamm 2013).

Machines approach an initial query first to ask for additional information to comprehend the problem accurately and to gain understanding of what it is asked. Scenario based learning and learning from data is the approach of machines for acquiring knowledge. Scenario based learning “uses scenarios, structured descriptions of real-world problems and related instructions, to support active learning” (Erol et al. 2016). According to this machines learning competence has following stages: generating hypothesis form evidence, ranking the acquired hypothesis and generating a question from it, and acquiring an answer depending on the earlier learned data. These data are once captured through its interaction with humans and the system will improve itself with time. Furthermore, it is able to digest not only textual information but also statistical data (Kelly and Hamm 2013). In Figure 1 Khobreh et al. (2016) exhibit Meta-Model of the Job-Know ontology. In other words, it consists three components and two relations as following: there is a task that requires competence that enables fulfilment of the task; knowledge, skills and abilities (KSA) qualify the competence that it also requires KSA.

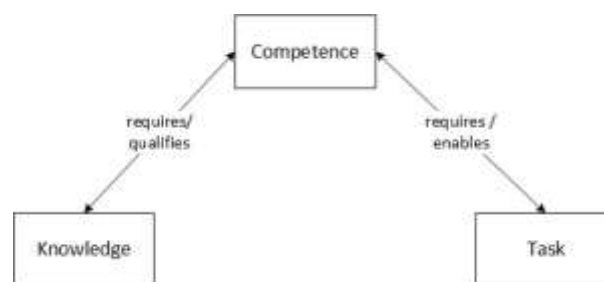


Figure 1: Meta-model of Job-Know ontology

Problem-solving as one of main proposed processes within manufacturing systems, is to identify optimal solution among other solution paths, in which they lead from an initial state to their (desired or undesired) goal state. To such it is required to determine and evaluate strategies of alternative paths (Vempaty et al. 2018). There are two agents to conduct this task: either human or machine, or a cooperative action (Ansari and Seidenberg 2016). Therefore, the rationality and bounded rationality of humans is questioned, as if rational decision-makers like machines have stronger/larger memory to store and computational competencies to make evidence-based decisions (Kelly and Hamm 2013; Vempaty et al. 2018).

Ansari et al. (2018a) evidenced, that there is a lack on exploring co-occurrence of human-machine learning, but their learning would be examined distinctively because of the tendency to differentiate the learning approaches both human and machine. To this reason mutual learning is defined in context of Industry 4.0, as “a bidirectional process involving reciprocal exchange, dependence, action or influence within human and machine collaboration, which results in creating new meaning or concept, enriching the existing ones or improving skills and abilities in association with each group of learners” (Ansari et al. 2018a).

A thorough study of learning curves in production and operations management stressed the performance improvements of workers as a result of task repetitions or experience; although there were only few discussions about forgetting (Glock et al. 2018). In this regard Kelly and Hamm (2013) state that providing learning systems first with information and rules, which they require to perform a well-defined task and second training them to utilize this information; this is combination of interaction and sophisticated algorithms that can rival the performance of a top human expert in a specific domain. It is assumed that something more than our comprehension from human-machine interaction will be practiced. Learning curves can predict, monitor and therefore improve the performance of individuals and are applicable to different sectors specifically production management as most popular area of research on learning curves. They emphasized on repetition as the ability to improve performance (Glock et al. 2018; Jaber and Glock 2013).

Dreyfus (2004) offers a 5 stage model of adult skill acquisition, in which after recognizing elements of task environment and accordingly following rules it is emphasized on gaining experience as a route to competence and learning. As said, at first stage individuals act like a heuristically programmed computer, giving them time, they act as a complex task seems normally solved. Interesting is the point, which computers do not have any sense of success or failure to identify, which stage to stop. In smart factory as a leaning environment, performing tasks is consisted of exchange, action or influences with certain level of dependency, that leads to mutual learning. Mutual learning has elements such as knowledge acquisition by human and machine and participation of both actors in doing shared task (Ansari et al. 2018a). As follows in Figure 2, Ansari et al. (2018a), depicted the elements of smart factory as a hybrid learning environment and indicated that knowledge and skill acquisition is only achieved with participation of both actors of human workers and intelligent machines.

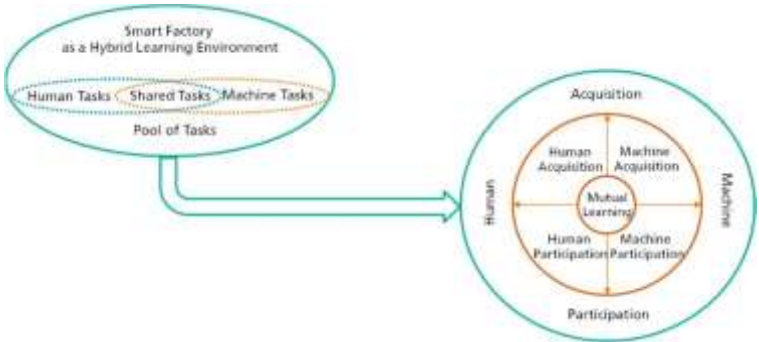


Figure 2: Mutual learning in relation to human-machine collaboration

Jaber and Glock (2013) assume there is a portion of time to perform any task, which is dedicated to process information, acquire and build-up knowledge. Learning occurs in the latter action and is called cognitive learning. So it is said, on worker level of Industry 4.0 there is an increase of automation through routine tasks and due to this, strong analytical competencies and generating practicable solutions are key features of future (Erol et al. 2016). Furthermore, domain knowledge of methods and languages are required for conducting a task or job both as main competencies of humans and machines (Erol et al. 2016; Kelly and Hamm 2013).

On factors cost and quality need to be focused, while the crucial factor time is formerly studied (Ganschar et al. 2013). The connecting systems aided by CPS enable speed and quality of experience transfer, which leads to ability of discovering problems faster and so to optimize production lines. Dreyfus (2004) highlight experience as main feature to build a route to gathering skills and learn; accordingly, Ansari et al. (2018a) consider quality and performance variation of a task implementation are leading indicators to identify the competency of human and machine to perform the assigned task.

3 Model to assess the quality of human-machine mutual learning

Models become not only prediction tools for studying a problem (Bondavalli et al. 2009), but also can contribute to description and explanation of a problem. They are capable of capturing key elements of system, type of correlation and their magnitude. To construct a model in order to evaluate the quality of reciprocal human-machine learning process successfully, it is required to characterize behaviour of human and machine (Vempaty et al. 2018), define crucial features and parameters to represent quality in this process, while disregarding irrelevant factors (Klein and Scholl 2012). This model will be a mean toward desired system. To the reason that this concept has not been discussed before the author has assumed parameters, which were supposed to be relevant in order to assess the process of mutual learning.

3.1 Quantifying the qualitative aspects

In order to build qualitative and quantitative models to evaluate quality, procedures are demanded, which can allow comparison based on qualitative and quantitative aspects. That can be undertaken with Evaluation techniques, while assisted by these methods, the subjective estimation is extremely considered. In this regard, a) criteria to reach parameters are operationalized, b) goals are set, and c) target conflicts are dissolved. These are called multi-criteria evaluation procedures (Klein and Scholl 2012), which are understood as Multiattribute Decision Making (MADM).

Applicable to the methodology and features of quality definition there are two major methods investigated: one possibility is to integrate qualitative aspects aided by Benefit analysis, or second Analytic Hierarchy Process (AHP). Their assignment includes firstly determination of functions for the high-preferred parameters and secondly ascertaining weighting factor for each parameter in the function (Klein and Scholl 2012). Both of methods belong to multi-criteria evaluation models with a difference on the one hand in theory basics and on the other hand, how they assist the model-constructor in the assignment of the model. In Utilizing benefit analysis, the results will be directly assigned to the parameter scales, while in AHP a comparison between alternatives can be undertaken supporting the goal. In this comparison one alternative will be preferred to the other and therefore will be chosen.

MADM methods require congestion of information, which is prone to subjective decisions that are made by model-constructor, e. g. operationalization of the parameters, which can lead to over- or undercompensating of the goal. This can be a negative aspect of MADM models (Klein and Scholl 2012). There are few methods for allocating values and so giving the weighting factors to the parameters. Applicable to MADM models are two techniques following: 1)

assigning ordinal or metric scaled values to any given goal or restricting the values of the goals to predefined ordered classes. Having many classes in latter technique it tends to transform to former, 2) assessing comparatively two goal pairs as determining, which one better is or assigning ratio scale to values (primarily used by AHP modeling).

An approach to set the parameters and gaining sufficient knowledge to make it applicable is realized by model-creator. This research is conducted principally with dummy data, while the access to real data is first of all restricted, as there are not many smart factories running and data are sensitive to acquire. Second researchers can familiarize themselves with real world before they get access to real data. Therefore, before any aroused complexity, researchers can assess the results of their operation. Positive point is that these data does not contain any data from specific person. Hence, the security is guaranteed because no anonymous data is used.

As stated, there are influential parameters for human-machine mutual learning systems, which will be analysed and given a weighting factor. This paper will examine and outline a MADM model. It should be considered during the process of modeling not to confuse the qualitative and quantitative models because of their similar characteristics. As the margin between quantitative and qualitative can be unclear and so one is misinterpreted as the other (Klein and Scholl 2012).

When the elements are defined as parameters and appear in form of equation and inequation, they reckon as mathematical or quantitative models; whereas constructing qualitative models is based on description and qualitative information, of which the former can be and the latter are usually influenced by subjective aspects. As a result, it is relevant to quantify qualitative data for formal evaluation of the qualitative models. That is due to the reason, that a quantitative model emphasizes first on precisely structuring problem, concentrates on relevant facts and can deal with the subjective aspects of individuals (Klein and Scholl 2012).

3.2 Evaluation of quality

3.2.1 Conceptualisation the model and its characteristics

According to section 3.1, it is necessary to define essential characteristics and features of, which will form the concept and interpretation of quality of mutual human-machine learning. It is important to measure and recognize the attributes of model and not to measure models (Churchill 1979). Ansari et al. (2018a) mention aspects and research gap that are beyond state of the art in the context of Industry 4.0 in the field of mutual human-machine learning; one is ascertained as measuring mutual learning outcome. To assess the effects of Industry 4.0 on decision-making tasks and examine the transferability of these tasks between human and CPPS (with emphasize on complementarity of human and machine instead of substitutability), three characteristics are offered, which are also elaborately considered by author. These are: handling/operation time, human error probability, and learning time (Ansari et al. 2018b).

To this, due to having lack of literature that discuss topic of human-machine learning or even assessing quality of a process considering some features, which create the definition of quality, the author intends to define, operationalise and summarize these characteristics in a model in order to provide better understanding of what is thoroughly discussed in literature review regarding learning skills through human, machine and human-machine. Quality is the

extent of the fulfilment between expectation and performance (Parasuraman et al. 1985) and according to this definition after fixing the determinants of mutual human-machine quality, it is a stage to assess the difference and gap between expected and accomplished outcomes. This occurs for both actors including human and machine. Subsequently, these form a weighting factor that this determinant of whole quality component can accomplish, which will be applied to the value function.

Again to highlight the complementarity of human and machine and to capture an aspect to define the quality of mutual learning, human competence level and CPPS autonomy degree is underlined (Ansari et al. 2018b, Ansari et al. 2018c). As cited before Dreyfus (2004) and Khobreh et al. (2016), the competence level subdivides to levels of experience, skills and ability. Ansari et al. (2018b) counterpose the competence level of human resources to autonomy degree of production systems; demonstrated that human developments are as: novice, competent, proficiency, expert and mastery (Dreyfus 2004), and machine developments as: notification, assistance, partial autonomy, conditional autonomy and full autonomy. The collaboration of human and CPPS occurs by mentioned human and machine levels of qualification. The term “qualification” (Ansari and Seidenberg 2016) instead of competence level (Ansari et al. 2018b, Ansari et al. 2018c) indicate the optimal collaboration of human and CPPS. Therefore, these both terms underpin qualification level of humans to fulfil a task.

3.2.2 Constructing model of Mutual Human-machine learning Quality

Kilibarda et al. (2012) propose a figure to demonstrate a model of quality of logistics service measurement. Figure 3 (Kilibarda et al. 2012) in the proposed research is elaborated by author, finding resemblances in both research.

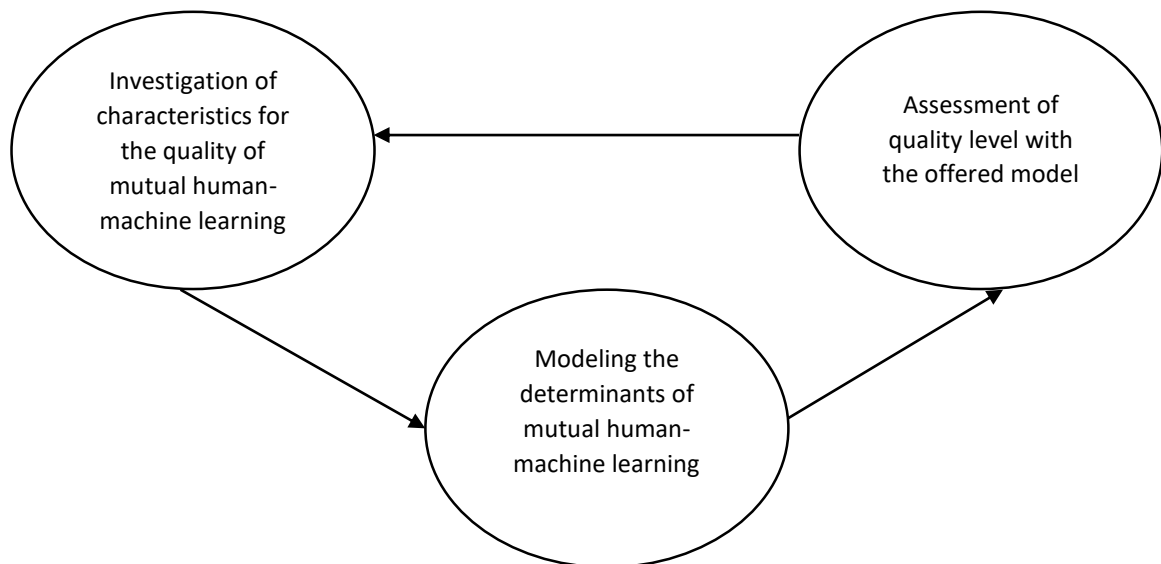


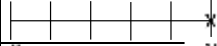
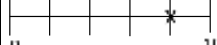

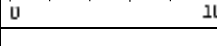
Figure 3: Model for assessing the quality of mutual human-machine learning

The model of mutual human-machine learning quality is based on following assumptions:

1. These definitions and subsequently values are summarized in Table 1 and Table 2 (author elaboration on the basis of section2) are relevant for each actor.

2. A task is defined, which can be undertaken in fixed time scale.
3. The to be assessed learning process is fulfilled by human and machine as a process of exchange of information.
4. Dependent variables are the determinant of quality, which are defined by author to an independent variable of time.
5. In Table 2, “H” stands for human and “M” stands for machine.
6. Weighting factors are those that depends on, how a determinant (parameter, attribute) influence the whole function or equation of quality.
7. Expected value is, what is required to be fulfilled to declare that human and machine have gained expected knowledge in the period of time and are capable of implementing a defined task.
8. Sustainability demonstrate, how long can the learnt material be retrieval. This learning can be sustainable, when e. g. captured knowledge be retrieved again after 3 weeks of break.

Table 1: Definition of Determinants of mutual human-machine learning process quality and their expected value

Determinants of quality		
Determinant	Definition	Expected value
Pace of task fulfilment (PoTF)	The measurement of task accomplishment in a fixed time scale	
Sustainability of learning (SoL)	Sustainable learning occurs when human and machine do not forget, what they have learnt and can start again, where they in past they left a task in past	
Capability to deal with complexity/diversity of task (CoT)	Depending on complexity/diversity of a task human and machine create different outcomes due to their level of cognitive competency	
Required competence level/ autonomy degree (degree of qualification (DoQ))	Competence level/autonomy degree highlights the level of acquisition skills/autonomy with respect to status of formal learning processes (depending on learning curves of both learners)	

Determinants are PoTF (a_1), SoL (a_2), CoT (a_3), and DoQ (a_4), which determine Quality of mutual human-machine learning (QohmL) as main component of this research. These can range between 0-10 as expected rate, which means how critical and influential is this determinant.

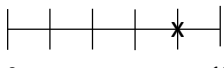
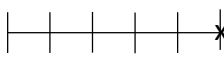
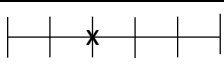
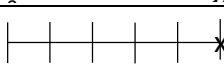
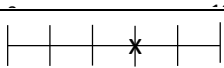
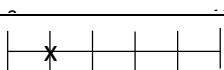
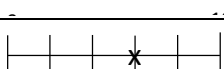
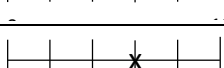
Depending on this expected value, the fulfilment rate can be calculated in which:

$$Fulfilment\ rate\ (FR) = \frac{resulted\ value}{expected\ value}$$

$$Weighted\ Fulfilmate\ Rate\ (WFR_k) = w_k * FR_k$$

Table 2: Comparison of expected values and resulted values of quality component determinant

Comparison of values

Determinant	Weighting factor (w)	Resulted Value		Fulfilment-rate	Weighted FR (WFR)
PoTF	0,3	H		0,8	0,24
		M		1	0,30
SoL	0,4	H		0,5	0,20
		M		1,2	0,48
CoT	0,15	H		1	0,15
		M		0,33	0,05
DoQ	0,15	H		0,6	0,09
		M		0,6	0,09

Weighting factors are given to emphasize on criteria, which can be essential for production sector. For example, it can defer from a smart factory to another. Some factories need more qualified resource and for some speed of implementation is important. It varies from each other and therefore it can be as an independent factor and set by production sector itself.

After defining the attributes and setting the expected value of learning from human or machine, a benefit analysis result (outcome value analysis) can be built:

$$\text{Overall Fulfilment Rate for human } OFR_H = \sum_{k=1}^n (WFR_k)_H$$

$$\text{Overall fulfilment Rate for machine } OFR_M = \sum_{k=1}^n (WFR_k)_M$$

for $n = 4$, H: human, M: machine

Conducting these set of formulas to calculate and therefore compare overall fulfilment rate for human and machine, following the differences will be calculated:

$$OFR_H = \sum_{k=1}^n (WFR_k)_H = 0,24 + 0,20 + 0,15 + 0,09 = 0,68$$

$$OFR_M = \sum_{k=1}^n (WFR_k)_M = 0,30 + 0,48 + 0,05 + 0,09 = 0,92$$

These values assist to draw a conclusion while comparing the achievement of human and machine in the process of mutual learning. In section 3.2.3 it will be discussed.

3.2.3 Interpretation and analysis of outcomes of the model

As it is said by Ansari et al. (2018a) potential of learning for human workers and intelligent machines depends on capabilities of both learners. Constructed model aims to demonstrate that the capability of actors in process of mutual learning impact directly the quality of human-machine mutual learning. Having adapted constructed data, the author attempts to ascertain the determinants representing quality of mutual learning and the classify importance of these adapting weighted factors. The outcome is weighted fulfilment rate, which express capability of each learner dependant on defined determinants.

These WFRs of different addressed determinants are amalgamated respective each learner distinctively to identify the differences and suggest recommendations for mutual learning approach. In order to compare and contrast what is the outcome of constructed model, figure 4 depicts WRF for each quality indicators (a_n). With help of both these methods it can analyse and interpret the outcomes of model.

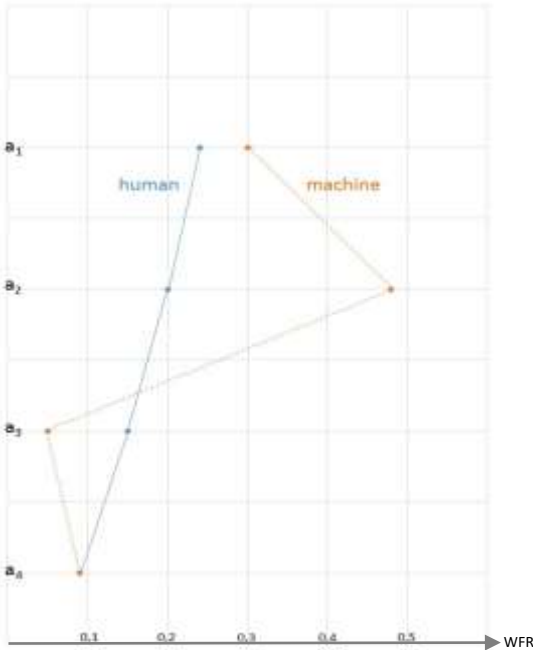


Figure 4: Comparison model of mutual learning fulfilment qualities between human and machine

Interpreting the calculations of OFR for both human and machines can be understood that considering the constructed data produced by author, machines will function far better than humans after the process of mutual learning. Having set pace of task fulfilment, sustainability of learning, capability to deal with complexity/diversity of task and required competence level/autonomy degree as defined determinants of model, respective overall study, machines indicated better learning outcomes.

The all factor inclusivity of benefit analysis should not be disregarded. This model realizes the attributes as a whole and it is not concrete which influences more on the result. Discussable is also the subjective aspect of model, which is caused by author and his understanding of theme. For this purpose, author decided to build another tool to compare the results in order to examine precisely each determinant with its WFR.

According to the figure 4 human does not have fluctuating rates in mutual learning. This can demonstrate that the competencies of human after mutual learning result relatively similar outcomes; whereas considering machines they have different approaches to different determinants; e. g. with regard to sustainability of learning, the waste of machine resources is seen. That means, machines learn so sustainable and do not forget anything that for simple tasks they can be waste of resource. Having FR of more than one is discussable and accordingly operations should be against that undertaken.

Degree of qualification indicates the required competence level/autonomy degree. Here the respective calculation of section 3.2.2 and figure 4 have resulted same values, which manifest the competence level of human and autonomy degree of machine run in same level while mutual learning process. Expressed the ideas in 3.2.1 competence level and autonomy degree will be enhanced in few stages and steps. Declaring the addressed ideas both human and machine can gain simultaneously KSA on the route to competent human and autonomous machine.

Regarding pace of task fulfilment both learners indicate approximately similar outcomes in the exemplar model in section 3, to which machine can have agile task fulfilment due to its computing skills. Capability to deal with a complex or diverse task is the only determinant that human can lead the skills of machine. The interpretation of this is directly linked to the special skills and objectives that human can only have and deliver, e. g. soft skills and the objectives delivered through soft skills. To this reason, it is hard for machine to overcome a complex or diverse task, thus, human can be a leading role.

Assisted by model and figure 4 produced from the value information in model, the characteristics of mutual human-machine learning is discussed and summarized. These model can be applicable to real data in order to achieve more concrete understanding form the process and the competencies of its learners. The amalgamation of weighted fulfilment provided an overview to quality of mutual human-machine learning.

4 Findings, conclusion and outlook

Findings of the conducted research paper and resulted information in section 3 will be summed up to outline this section. Identifying the key characteristics of quality in process of mutual learning is the main discussion of the paper. In this paper, it is attempted to identify these attributes while reviewing the literature and conducting state of the art. For this purpose, having said it is appropriate to find gaps of knowledge in the literature that have respectively resemble topics and to extract relevant aspects from these literature.

Intelligent manufacturing has features that require to be discussed. Mutual learning occurs within intelligent manufacturing systems or smart factories which are equipped with machines that are connected and can transfer data and information in real time.

In addressed smart factories machines have the ability to learn and to teach; this is the basis of mutual human-machine learning. They are accessed to a huge amount of data, with which they can learn and can enhance their performance and autonomy. On the other hand, human can develop their skills and competencies with learning. This learning can not only be independently, but also the emphasize of this research is to implement, ease, demonstrate and review the mutual learning process. This is the foundation for the discussed model.

In the model literature-based relevant characteristics of mutual human-machine learning are defined and operationalized. The definitions attributed to the determinants have been concluded from the literature review. Having had expected value and fulfilment value to assess the quality, which is the ratio of these two, the fulfilment rate is built. Weighted fulfilment rate is created by underlining it with weighted factor. Finally, the amalgamation of WFR corresponding defined determinants is calculated. With this method the quality of human and machine separately learning process is assessed. Desiring more precise interpretation and analysis a figure is constructed to depict details.

Section 3.2.3 can be summarized by acknowledging machines manifested higher overall fulfilment rate; although it should be mentioned, that the method of benefit analysis has inclusive perspective of all determinants, which impedes the decision-maker of the model to have detailed overview of influential characteristics. To facilitate to compare and contrast figure 4 has contributed to draw detailed conclusions. It is emphasized on skills of human and machine that are enhanced through the process of mutual learning.

After conducting state-of-art and reviewing literature the lack of theories to apply to practice and smart factories is disclosed. Quality as a feature of a process is scarcely discussed. To this, there are opportunities in this regard to define other quality aspects of mutual human-machine learning and apply it to this model.

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Financing R&D and Innovation - New Tools and Approaches

The goodwill relevance in cash flow forecasting – the Portuguese case

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Abstract:

This study aims to analyse in what extent goodwill and goodwill impairment losses are relevant to the cash flows forecasting in Portugal. We explore the goodwill and goodwill impairments losses forecasting ability to predict cash flows using multiple linear regression models with one-year-ahead cash flows as a dependent variable in each regression model and including the goodwill and goodwill impairment losses in the independent variables. Our sample includes Portuguese companies consolidated annual reports belonging to the PSI-20 index and covers the period between 2010 and 2017. Regression results from the estimated models show that our key variable goodwill is statistically significant, indicating that the goodwill have significant predictive ability for one-year ahead cash flows being an important variable to consider by the users of financial statements in forecasting future cash flows and in making economic decisions. The reported goodwill Impairment losses results reveal a significative and negative sign for its estimated coefficient. However, the estimated coefficient on goodwill is negative, raising the question whether the goodwill reported by Portuguese entities is really perceived as an “productive asset” or not.

Keywords: Cash flow forecasting, Goodwill, Goodwill impairment.

1 Introduction

The use of International Financial Reporting Standards (IFRS) in the European Union (EU) has become mandatory in 2005 for all companies with securities admitted to listing on the EU stock exchange market when preparing their consolidated accounts. This imposition has led

to the development of a multiplicity of studies seeking to analyse the economic and financial consequences of this mandatory adoption and the benefits for users of financial statements.

Among the standards that caused the greatest changes in reporting we find the IFRS – 3 Business Combinations establishing the rules for the accounting when an acquirer obtains control of a business, defining the use of the acquisition method, which generally requires assets acquired and liabilities assumed to be measured at their fair values at the acquisition date. According to the International Accounting Standards Board (IASB), “IFRS 3 seeks to enhance the relevance, reliability and comparability of information provided about business combinations (e.g. acquisitions and mergers) and their effects. It sets out the principles on the recognition and measurement of acquired assets and liabilities, the determination of goodwill and the necessary disclosures”.

The IFRS 3 – Business Combinations define the concept of goodwill and established procedures for conducting impairment tests. Its implementation is mandatory as a result of the effort to harmonise international goodwill accounting and improve the quality of the information transmitted in the financial statements. The establishment of impairment tests (and non-amortization) was criticized and widely debated among those that defended the impairment testing and those that defended the systematic amortization of goodwill, arguing the last group that managers would face strong resistance to impairment testing, leading to poor expression of impairment losses and the indefinite maintenance of the value of goodwill as companies’ intangible assets. Several studies suggest that this is in part induced by the management tendency to avoid recognition of impairment losses (Ramanna and Watts 2012; Andre et al. 2015; Filip et al. 2015; Stenheim and Madsen 2016; Li and Sloan 2017; Ayres et al. 2018). Even recently in Portugal, and as regards individual accounts, in 2016, this mandatory impairment test (and non-amortization) was changed, with goodwill now being measured at cost less accumulated amortization, less accumulated impairment losses.

In this context, several empirical studies try to assess the relevance of goodwill and goodwill impairments accounting treatment and consequent impact on the economic and financial information disclosed by listed companies. The research on goodwill and goodwill impairment losses has followed different orientations, and studies have been found on the accounting impact of applying new rules, on the reaction of the capital markets, on the impact in the decisions of non-capital market information users, among others.

Several authors focus on the analysis of the market reaction to the goodwill and goodwill impairment losses recognized in companies’ financial statements trying to assess the statistical significance of the recognition of goodwill in explaining stock price behaviour (Oliveira et al. 2010; AbuGhazaleh et al. 2012; Qureshi and Ashraf 2013; Hamberg and Beisland 2014; Fernandes and Gonçalves 2014; Vallius 2016; Fernandes et al. 2016; Bilal and Abdenacer 2016; Souza and Borba 2017; Maldonado et al. 2019).

Other studies analysed the importance of goodwill and goodwill impairment losses for the different users of financial statements in forecasting future cash flows and in making economic decisions (Barth et al. 2001; Jarva 2009; Lee 2011; Bostwick et al. 2016; Amorós-Martínez and Caveró-Rubio 2018; Choi and Nam 2018).

Following this second research field and aiming to contribute to fill the gap left by the existence of few studies in the European context, this study aims to analyse in what extent

goodwill and goodwill impairment losses are relevant to the cash flows forecasting in Portugal. Our sample includes Portuguese companies' consolidated annual reports belonging to the PSI-20 index and covers the period between 2010 and 2017.

In addition to this introduction of the theme, this article presents in chapter 2 a brief literature review and research hypotheses. In chapter 3 methodology is presented, chapter 4 displays the data and summarizes the main results and chapter 5 concludes.

2 Literature review and hypothesis

Corresponding the goodwill to future economic benefits resulting from assets that are not capable of being individually identified and separately recognized, under the terms of the Portuguese NCRF 14 – Business Combinations and IFRS 3 – Business Combinations, several are the empirical studies that focus the attention on the goodwill accounting treatment and its consequent impact on the economic and financial information disclosed by listed companies. Among the focused aspects we highlight the research on goodwill and goodwill impairment losses accounting treatment and consequent impact on the economic and financial information disclosed by listed companies.

We can find in the literature several studies that emphasize the capital markets reaction to the goodwill and goodwill impairment losses recognized in companies' financial statements. In fact, in the 1980s and 1990s, studies such as Elliott and Shaw (1988) and Francis et al. (1996) concluded that markets did not have any kind of reaction to goodwill impairment losses. Recent studies as Dahmash et al. (2009), Oliveira et al. (2010), Xu et al. (2011), AbuGhazaleh et al. (2012), Qureshi and Ashraf (2013), Fernandes and Gonçalves (2014), Bilal and Abdenacer (2016) and Maldonado et al. (2019) point out that identifiable intangible assets and goodwill contribute positively to the stock price. However, Hamberg and Beisland (2014) and Vallius (2016) conclude that there is no relationship between the value of goodwill and the market value per share. Regarding the goodwill impairments, Bens et al. (2011), Fernandes and Gonçalves (2014) and Fernandes et al. (2016) find a symmetrical relationship between the stock market price and the goodwill impairments.

With regard to the importance of goodwill and goodwill impairment losses in forecasting future cash flows and in making economic decisions and according to Bostwick et al. (2016, p.339) "The accounting profession has long recognized that cash flow prediction is one of the fundamental uses of financial information (...). However, goodwill information is often ignored in cash flow prediction models". In this context, this study will address the importance of goodwill and goodwill impairment losses for the different users of financial statements when forecasting financial indicators, namely future cash flows in line with the research of authors as Jarva (2009), Lee (2011), Lee and Yoon (2012), Bostwick et al. (2016), Amorós-Martínez and Caveró-Rubio (2018), Choi and Nam (2018), among others.

In order to assess if the goodwill write-offs recognized in accordance with the American SFAS 142 (Statement of Financial Accounting Standards 142 – Goodwill and Other Intangible Assets) are associated with future expected cash flows as mandated by the standard, Jarva (2009) study the hypothesis if goodwill write-offs are positively associated with expected future cash flows for companies listed on the New York (NYSE), American (AMEX) and NASDAQ markets that reported goodwill impairments between 2002 and 2005. The variable goodwill

impairments were introduced as a negative value; therefore, a positive association imply that more negative write-offs lead to more negative expected future cash flows. According with Jarva (2009) regression results, the estimated coefficients on goodwill write-offs are statistically significant and positive for one- and two-year-ahead cash flows, lead to the conclusion that goodwill write-offs are associated with future expected cash flows.

Lee (2011), Lee and Yoon (2012) and Bostwick et al. (2016) also examine the efficacy of SFAS 142 in USA by focusing on the projection of cash flows. As point out by Lee (2011, p.241), “forecasting future cash flows is an important benchmark for the usefulness of accounting information” and his results show that the ability of goodwill to predict future cash flows has improved since the Financial Accounting Standards Board (FASB) adopted SFAS 142.

With a sample of US firms for a time frame from 1995 to 2006, Lee (2011) regression results show that the coefficient for the goodwill present on financial statements is positive and significant, suggesting that SFAS 142 “improves the informativeness of goodwill in terms of its ability to predict future cash flows by reflecting the underlying economics of those assets” (Lee, 2011, p.250).

Testing how goodwill accounting influences persistence of earnings for testing reliability issue of SFAS and whether goodwill accounting affects earnings’ ability to predict future cash flows for testing relevance dimension, Lee and Yoon (2012) study was developed for a sample of US companies and for the period from 1995 to 2006. The same conclusion as Lee (2011) is reached by Lee and Yoon (2012, p.125), whose findings indicate that the “ability of earnings to predict the future operating cash flows and earnings persistence significantly improved post-SFAS No. 142 compared to the firms unaffected by the statement”.

Addressing the impact of goodwill impairments on cash flow forecasting and also for US companies, Bostwick et al. (2016) test if goodwill impairments provide a significant, incremental improvement in the prediction and forecasting of future cash flows for a time horizon from 2001 to 2009. The authors find that goodwill impairments are inversely related to future cash flows and that the inclusion of goodwill impairments improves the prediction of future cash flows.

Using a sample of Korean listed firms, Choi and Nam (2018) examine the abilities of goodwill and its impairment write-offs in predicting future expected cash flows, also finding that goodwill and goodwill impairments have a significant predictive ability for expected future cash flows up to two-year-ahead cash flows. Choi and Nam (2018) results indicate that goodwill and goodwill impairments are positively associated with future expected cash flows. However, when testing the if the predictive ability differs between firms recognizing impairments based on normal and discretionary motives, “the analysis reveals that discretionary impairment recognition tends to amplify the ability of goodwill balance and goodwill impairment write-offs to predict future expected cash flows with negative and positive relations respectively” (Choi and Nam 2018, p. 83).

In the European context, we only found a study for the Spanish market. Seeking to assess the effects of the mandatory adoption of IFRS 3 in 2005 for all companies with securities admitted to listing on the EU stock exchange market when preparing their consolidated accounts, Amorós-Martínez and Cavero-Rubio (2018) use a random sample of annual consolidated balance sheets from 85 companies extracted from the total companies listed in the Spanish

securities market. The regression results lead to the conclusion that the goodwill regulation of IFRS affects the financial information transmitted by companies and that goodwill and goodwill reduction explain future cash flows: goodwill has a negative and significant association with future cash flows and goodwill impairments has a positive association with future cash flows.

Aiming to contribute to fill the gap left by the existence of few studies in the European context, this study aims to analyse in what extent goodwill and goodwill impairment losses are relevant to the cash flows forecasting in Portugal.

In this context and based on the literature previously mentioned, we formulated our research hypothesis establishing the relationship between the dependent variable one-year ahead cash flow and the reported Goodwill and Goodwill impairment losses at the end of the previous year:

H1: There is a significant relationship between to the goodwill reported in companies' financial statements and future cash flows.

H2: There is a significant relationship between to the goodwill and goodwill impairment losses reported in companies' financial statements and future cash flows.

Based on the approaches followed by Lee (2011) and Choi and Nam (2018), we will explore the goodwill and goodwill impairments losses forecasting ability to predict cash flows using multiple linear regression models with one-year-ahead cash flows as a dependent variable of each regression model and including the goodwill and goodwill impairment losses in the independent variables.

3 Methodology

In order to gather evidence if the goodwill and goodwill impairment losses are relevant to the cash flows forecasting in Portugal, we followed the methodology proposed in previous studies, adapting the Feltham and Ohlson (1995) model in order to highlight the information relating to goodwill and goodwill impairment losses. This way, we assume the existence of a relationship between future cash flows with companies' book value, goodwill and goodwill impairment losses.

The hypothesis analysis was carried out by extending the following model:

$$CF_{i,t+1} = \beta_0 + \beta_1 CF_{i,t} + \varepsilon_{i,t} \quad (1)$$

where the dependent variable is $CF_{i,t+1}$, the Cash-flow for company i at the end of year $t+1$, and the independent variable $CF_{i,t}$ represents the Cash-flow for company i at the end of the previous year t .

In order to test the goodwill and goodwill impairments losses forecasting ability to predict cash flows, we expanded the base model incorporating the following independent variables:

- $GW_{i,t}$ representing the reported goodwill for company i at the end of the previous year t ;

- Imp_GW_{i,t} representing the reported goodwill Impairment loss for company i at the end of the previous year t;
- CP_GW_{i,t} representing the reported equity minus goodwill for company i at the end of the previous year t.

The models obtained constituted the basis for testing the previously established research hypotheses. Model I, defined as:

Model I:

$$CF_{i,t+1} = \beta_0 + \beta_1 CF_{i,t} + \beta_2 GW_{i,t} + \varepsilon_{i,t} \quad (2)$$

allow to test the existence of relationship between to the goodwill reported in companies' financial statements and future cash flows (H1).

The relationship between to the goodwill and goodwill impairment losses and future cash flows (H2), will be tested thru Models II and III:

Model II:

$$CF_{i,t+1} = \beta_0 + \beta_1 CF_{i,t} + \beta_2 GW_{i,t} + \beta_3 Imp_GW_{i,t} + \varepsilon_{i,t} \quad (3)$$

Model III:

$$CF_{i,t+1} = \beta_0 + \beta_1 CF_{i,t} + \beta_2 GW_{i,t} + \beta_3 Imp_GW_{i,t} + \beta_4 CP_GW_{i,t} + \varepsilon_{i,t} \quad (4)$$

The dependent and independent variables were deflated by total sales as proposed by Lee (2011), that justifies this option on the premise that this figure is less susceptible to a firm's endogenous reporting or investment decision related to goodwill.

4 Data and results

The sample in this study comprises companies belonging to the Portuguese PSI-20 index. From the initial sample of 20 companies that are part of the PSI-20, the entities belonging to the banking sector were excluded, as well as those that do not reported goodwill in their financial statements. This has resulted in the extraction of the 14 entities that report goodwill in their financial statements in the period from 2010 to 2017.

The data collected was obtained through the SABI database and the missing elements were obtained directly from the reports and accounts of the entities in question. It should be noted that we exclude all banking entities due to the specificity of the accounting regulations adopted by these entities.

The analysed entities were grouped according to the ICB Sectorial Classification – Industry, corresponding to the following sectors in table 1: Basic Materials, Industrials, Consumer Goods, Consumer Services, Utilities, Financials, Oil and Gas.

Table 1 also presents the goodwill relative weight on total assets (GW Relative Weight) with reference to the year 2017. Of the companies with the largest relative weight of goodwill, the most significant are: Ramada from the Basic Materials sector (21,94%), Mota Engil from the Industrial sector (21,25%), Ibersol from Consumer Services (15,30%) and Galp Energia from Oil and Gas sector (15,47%).

The dependent variable is the cash flow for company i at the end of year $t+1$. The main independent variables represent cash flow for company i at the end of the previous year t , goodwill for company i at the end of the previous year t , goodwill impairment losses for company i at the end of the previous year t and equity minus goodwill for company i at the end of the previous year t . All variables were deflated by total sales.

Table 1

ICB Sectorial Classification and GW Relative Weight on total Assets – 2017

			ICB Relative Weight	GW Relative Weight
Ramada	1000	Basic Materials	21,43%	21,94%
Semapa	1000	Basic Materials		1,13%
Navigator Companie	1000	Basic Materials		0,59%
Altri SGPS	2000	Industrials	21,43%	5,31%
CTT Correios de Portugal	2000	Industrials		0,68%
Mota Engil	2000	Industrials		21,25%
Corticeira Amorim	3000	Consumer Goods	7,14%	0,82%
Ibersol, SGPS	5000	Consumer Services	21,43%	15,30%
NOS, SGPS	5000	Consumer Services		0,40%
Sonae, SGPS	5000	Consumer Services		0,36%
EDP	7000	Utilities	14,29%	8,83%
REN	7000	Utilities		11,32%
Sonae Capital	8000	Financials	7,14%	9,18%
Galp Energia	0001	Oil and Gas	7,14%	15,47%

Note: The table presents the sectorial classification of the 14 companies in the sample as well as their relative weight. The proportion of goodwill in relation to the total assets of each entity as at 31 December 2017 is also shown.

Table 2 presents the descriptive statistics for the variables used in the regression analysis of the relevance of goodwill and goodwill impairment in cash flow forecasting. The analysis shows an average goodwill deflated by total sales of 0,1487632€, with a maximum of 0,5539464€. The reported goodwill impairment losses deflated by total sales presents a mean value of 0,00185€, with a maximum of 0,1204819€. We also note an average reported equity minus goodwill deflated by total sales of 0,5877024€, with a minimum of -0,3105461€ and a maximum of 2,885043€.

Table 2

Descriptive statistics

	Mean	Std. Dev.	Min	Max
$CF_{i,t}$	0,1940661	0,3443326	-0,4632616	1,818797
$GW_{i,t}$	0,1487632	0,1516151	0	0,5539464
$Imp_GW_{i,t}$	0,00185	0,0123716	0	0,1204819
$CP_GW_{i,t}$	0,5877024	0,5974586	-0,3105461	2,885043

NOTE: Table reports the Descriptive statistics for the variables $CF_{i,t}$ representing the cash flow for company i at the end of the previous year t , $GW_{i,t}$ representing the reported goodwill for company i at the end of the previous year t , $Imp_GW_{i,t}$ representing the reported goodwill impairment loss for company i at the end of the previous year t and $CP_GW_{i,t}$ representing the reported equity minus goodwill for company i at the end of the previous year t .

Table 3 provides the Pearson correlation matrix, which summarizes the nature and the level of different associations between variables. All variables have positive correlations with the independent variable cash flow at the end of year $t+1$, being the most significant positive correlation the one of equity minus goodwill of the previous year. We also note the correlations between previous year reported goodwill and goodwill impairment loss, reinforcing the conclusions of some previous studies of an existing correlation between cash flows and goodwill/goodwill impairment losses, present in companies' financial statements.

Table 3
Pearson correlations

	$CF_{i,t+1}$	$GW_{i,t}$	$Imp_GW_{i,t}$	$CP_GW_{i,t}$
$CF_{i,t+1}$	1,0000			
$GW_{i,t}$	0,0651	1,0000		
$Imp_GW_{i,t}$	0,0773	-0,0045	1,0000	
$CP_GW_{i,t}$	0,4923	-0,2863	0,1344	1,0000

NOTE: Table reports the Pearson correlations for the variables $CF_{i,t+1}$ representing the cash flow for company i at the end of year $t+1$, $GW_{i,t}$ representing the reported goodwill for company i at the end of the previous year t , $Imp_GW_{i,t}$ representing the reported goodwill impairment loss for company i at the end of the previous year t and $CP_GW_{i,t}$ representing the reported equity minus goodwill for company i at the end of the previous year t .

To estimate the parameters corresponding with the variables we employ the Arellano and Bond (1991) generalized method of moments (GMM) estimator. Table 4 reports the results for Arellano–Bond dynamic panel GMM two step estimator related to the ability of goodwill to predict future cash flows (Model I), goodwill and goodwill impairments (Model III) and goodwill, goodwill impairments and equity (Model III). The Sargan test results confirm the null hypothesis for the tree models and reveal that the over-identifying restrictions are valid, assessing the model's robustness. The Arellano-Bond tests for serial correlation not detect any serial correlation problem in the residuals.

The estimated coefficient on goodwill is statistically significant and negative for one year ahead cash flow, the opposite of Lee (2011) and Lee and Yoon (2012) results that indicate a positive and significant association between goodwill charge and future cash flows in the period post-SFAS 142. However, consistent with the results of Amorós-Martínez and Caveró-Rubio (2018) for the Spanish case and post- IFRS 3 period. This finding is also partly consistent with Choi and Nam (2018) that also found a negative coefficient for goodwill implying that entities who report larger goodwill values in their financial statements tend to achieve lower futures cash flows, raising the question whether reported goodwill by Portuguese entities is really perceived as a “productive asset” or not.

Table 4
Model Estimation Results

	Model I					Model II					Model III				
$CF_{i,t+1}$	Coef.	Std. Err.	z	P-value		Coef.	Std. Err.	z	P-value		Coef.	Std. Err.	z	P-value	
$CF_{i,t}$	0,733	0,006	116,16	0,000	***	0,612	0,007	93,21	0,000	***	0,536	0,010	51,57	0,000	***
$GW_{i,t}$	-0,838	0,010	-83,60	0,000	***	-0,956	0,015	-63,79	0,000	***	-0,715	0,022	-32,88	0,000	***
$Imp_GW_{i,t}$						-1,782	0,038	-47,11	0,000	***	-1,701	0,052	-32,50	0,000	***
$CP_GW_{i,t}$											0,154	0,009	17,33	0,000	***
Const.	0,173	0,011	15,65	0,000	***	0,205	0,014	14,97	0,000	***	0,094	0,020	4,80	0,000	***
Wald test			101117,28 (2)	0,000				117366,14 (3)	0,000				241839,80 (4)	0,000	
Sargan test			12,388 (20)	0,902				11,771 (20)	0,924				11,691 (20)	0,926	
AR(2)			-1,347	0,178				-1,268	0,205				-1,453	0,146	

NOTE: The regression was performed using a data panel consisting of 14 companies and 112 observations for the period from 2010 to 2017. Table reports the Arellano-Bond dynamic panel-data estimation for Models I, II and III, where $CF_{i,t+1}$ represents the cash flow for company i at the end of year t+1, $CF_{i,t}$ represents the cash flow for company i at the end of the previous year t, $GW_{i,t}$ represent the reported goodwill for company i at the end of the previous year t, $Imp_GW_{i,t}$ represent the reported goodwill impairment loss for company i at the end of the previous year t and $CP_GW_{i,t}$ represent the reported equity minus goodwill for company i at the end of the previous year t. *, **, *** represent the coefficients which are statistically significant at the level of 10%, 5% and 1%, respectively. The Wald test has a p-value lower than 5% indicating that the set of coefficients is asymptotically distributed as χ^2 under the null hypothesis without significance; the degrees of freedom are represented in parentheses. Sargan's test presents a p-value greater than 5% showing that the instruments are valid and the values between parentheses represent degrees of freedom. The Arellano-Bond test is distributed asymptotically as $N(0,1)$ under the null hypothesis of no serial correlation; the AR test (2) indicates that there are no serial correlation problems.

Regarding the reported goodwill impairment losses, results reveal a significant and negative sign for its estimated coefficient, consistent with the Jarva (2009) and Bostwick et al. (2016) opinion that goodwill impairments are significantly and inversely related to one year ahead cash flow, but inconsistent with Amorós-Martínez and Caveró-Rubio (2018) and Choi and Nam (2018). Amorós-Martínez and Caveró-Rubio (2018) establish a positive relationship between the goodwill impairment losses and one-year ahead cash flows for the Spanish entities included in the sample and in the post-IFRS period. Choi and Nam (2018) also obtain a significant and positive relation between the goodwill impairment losses and one-year ahead cash flows for the Korean case.

Regression results for the tree models indicate that, as expected, current cash flow is a positive and significant predictor of one year ahead cash flow, in line with Jarva (2009), Lee (2011), Bostwick et al. (2016) and Amorós-Martínez and Caveró-Rubio (2018). Also, the reported equity minus goodwill coefficient presents itself with a positive and statistically significant coefficient pointing to its ability to assess future cash flows as in Amorós-Martínez and Caveró-Rubio (2018).

5 Conclusion

This study aims to analyse in what extent goodwill and goodwill impairment losses are relevant to predict future cash flows for Portuguese listed companies in the period from 2010 to 2017. The sample includes 14 entities belonging to the PSI-20 index that present goodwill in their balance sheet during the period under study.

The results confirm the findings of previous studies (Lee 2011, Bostwick et al. 2016, Amorós-Martínez and Caveró-Rubio 2017, Choi and Nam 2018) and our H1 hypothesis that there is a significant relationship between the goodwill reported in companies' financial statements and future cash flows. However, the goodwill coefficient is negative for one year ahead cash-flow, contrary to the results of Lee (2011) and Lee and Yoon (2012) but consistent with Amorós-Martínez and Caveró-Rubio (2018) and partly in line with Choi and Nam (2018), raising the question whether reported goodwill by Portuguese entities is really perceived as a "productive asset" or not.

The goodwill impairment losses seem to be reflected in one-year ahead cash flows, in line with the most common tendency in the literature that establish a significant relationship between goodwill impairment losses and the future cash flows. Nevertheless, the results do not point in the same direction, being consistent with Jarva (2009) and Bostwick et al. (2016) but contrary to those obtained by Amorós-Martínez and Caveró-Rubio (2018) and Choi and Nam (2018). These results raise the need to expand the study, covering a broader sample of entities that report goodwill and goodwill impairments in their financial statements.

Also, the regression results for all models indicate that current cash flows and equity minus goodwill coefficients are positive and present themselves as significant predictors of one year ahead cash flow. The results of this study are important for several information users, such as investors in general and regulators, that use financial statements for forecasting future cash flows and in making economic decisions.

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Gig Economy, Solo-Self-employment and Freelancers in the Knowledge Economy

Independent Professionals: Knowledge-intensive work between the professions and new expert occupations

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Abstract: Independent professionals (iPros) constitute a growing portion of the labour market in knowledge-based (business) services (KBS) and professional occupations. They work as self-employed workers without employees, sell specific knowledge-intensive (intellectual) services in external labour markets outside of standard employment relationships and contribute, among other things, to the innovative capacity of other companies. As part of the self-employed workforce they practice traditional ‘liberal’ professions (lawyers, doctors, journalists etc.) as well as new expert occupations (consulter, software developer etc.). By drawing on time series data from the Austrian labour force survey (LFS) this paper presents growth trends for iPros in knowledge-based service sectors and professional occupations in Austria for the time period 2004 to 2017. The results show that iPros are the fastest growing group on the Austrian labour market.

Keywords: independent professionals (iPros), freelancer, solo self-employment, knowledge-based services, entrepreneurship

1 Introduction

The nature of work and the institutional structure in which work is performed have changed multiple times throughout history. With the evolution of digital technologies and the Internet, many of today’s jobs did not exist a few years ago and routine work is likely to be automated in near future (Frey & Osborne, 2013). In this disruptive economic environment specific personal skills become important for people to secure their jobs (EPSC, 2016). A highly skilled and creative workforce is seen as a main driving factor for competitive advantage in the knowledge economy or “informational economy” (Castells, 2010) where ideas and knowledge are the engines of economic growth and prosperity (Audretsch, 2009).

Currently, the majority of workers in Europe still hold permanent contracts however, with those enormous changes in the digital economy we recognise shifts away from permanent employment relationships to alternative work arrangements such as short-term contracts, part-time work or teleworking (Spreitzer, Cameron, & Garrett, 2017). Independent professionals (iPros), mostly called freelancers in the creative industries, are at the core of these developments in workforce (Leighton & Brown, 2013). They are mobile, independent workers who provide their specific services to clients (e.g. in the areas of design, software,

video, advertising, consulting) personally, independently and professionally. They offer their workforce on the external labor market outside of standard employment relationships and mostly outside of or in-between established organizational boundaries (Osnowitz, 2013). As such, they are generally classified under the statistical category of solo self-employed workers in the service sector, differing from other (solo) self-employed workers in the agricultural, commercial or trade sectors (Bögenhold, Heinonen, & Akola, 2014).

2 Independent professionals as a category of self-employed workers without employees

Although self-employment can be regarded as universal with regard to its employment classification, the “group” of self-employed workers is not homogenous (Bögenhold, 2019). The statistical category of self-employment contains different socio-economic groups, which are only partially covered by the distinction between the self-employed with employees (‘employers’) and the self-employed without employees (‘own-account workers’) (Dvouletý, 2018). In order to capture the different working and living situations of these types of self-employed workers properly additional or other criteria might be necessary.

A recent study conducted by the Eurofound (2017) on self-employment in Europe has shown that the self-employment workers in Europe (32.0 million) are heterogeneous in terms of economical sustainability, operational autonomy and entrepreneurialism and that they could accordingly be clustered in 5 different “groups”. In two of the five clusters (employers: 7.4 million and stable own-account workers: 8.3 million) self-employed workers face favorable economic conditions, have more autonomy in their working lives and are more likely to be self-employed out of choice than of necessity. On the other hand there are two clusters (vulnerable: 5.4 million and concealed: 2.6) where the self-employed people are generally more dependent, have less autonomy over their work, lower levels of income and less job security (Eurofound, 2017, pp. 17-20). The self-employed workers without employees are represented across all five clusters, which indicates that the diversity in this group is even more pronounced than in the group of employers.

With regard to economic sectors and occupations the report furthermore suggests that most self-employed workers in knowledge-based service sectors and professional occupations are distinctive from self-employed workers in the industry, construction or other service-based sectors and occupations (Eurofound, 2017, p. 21). Highly skilled and educated individuals who work on their own without any employees in knowledge-based service sectors and professional occupations are not examined in detail in the report, although they constitute a growing part of the self-employed workforce in Europe (Leighton & Brown, 2013).

One of the first studies carried out explicitly on independent professionals (iPros) in Europe defines them as „independent workers without employees engaging in a service activity and/or intellectual service not farming, craft or retail sectors (Rapelli, 2012, p. 11)“. According to this definition of iPros, there were approximately 8.6 million people in the year 2011 that worked as micro businesses in specific professional service sectors in Europe. In terms of the total European working population this is less than 4%, but if you look at this number as a proportion of all self-employed people (employers and independent workers without employees in all sectors combined) or as a proportion of all solo self-employed, then iPros account for 26% or 37% (Rapelli, 2012, p. 12).

The definition proposed by Rapelli (2012) discerns iPros from other self-employed workers by classifying them according to the economic sectors in which they operate. By relying on Eurostat's NACE classification, which is a statistical classification of different economic activities, iPros can be defined in terms of particular service sectors. Therefore, iPros are all solo self-employed persons who work in knowledge-based service sectors (tertiary sector) without the retail, transportation, accommodation & food services and public administration sectors (Rapelli, 2012, p. 9). Such a broad definition makes it possible to statistically capture a large number of micro-self-employment in knowledge-based sectors, but does not do justice to the heterogeneity of this sector. In particular, the distinction between knowledge-intensive work that requires highly specific skills and long training periods and other personal services is not adequately shown here.

Another way of defining and estimating iPros or freelancers as they are also called is by using occupational classifications systems like the International Standard Classification of Occupations (ISCO) or the Standard Occupational Classification (SOC) System. Kitching (2015) for example defines freelancers according to the SOC major groups 1 to 3, which refer to 'managers, directors and senior officials', 'professional occupations' and 'associate professional occupations'. Occupations in these three groups correspond with knowledge-intensive non-manual work and therefore provide a criterion to demarcate iPros from other types of own-account working (Kitching, 2015, p. 17).

Both approaches to define iPros and empirically estimate their numbers in the current workforce are possible and have their advantages and disadvantages. In this paper we will apply first a sector-related and then an occupation-related characterization of own-account workers in knowledge-based services (Mason, 2018). This approach allows us to compare the estimates made by both definitions.

2.1 Knowledge-based and knowledge-intensive (business) services

Knowledge-based services (KBS) or knowledge-intensive (business) services (KIBS) are central elements of the so-called "informational economy" (Castells, 2010), in which knowledge production, information processing and symbolic communication became the main source of economic productivity, growth and prosperity (Audretsch, 2009). The creation of value in this type of economy is based on (new) information technologies, which in turn depend on the capabilities for development of such technologies and their applicability in different sectors (Castells, 2010, p. 258).

The need for KBS arises from the unequal distribution of knowledge and information in society (Hayek, 1945). It is often the case that knowledge needed to solve certain tasks or problems is not immediately accessible. Actors possess only 'limited stocks of knowledge', whose contents and forms depend on prior individual or organisational resources, particular development paths and social embedding in groups of individuals or organisations. In order to carry out particular tasks, actors are therefore dependent on knowledge that other actors might have at their disposal and to which one has no direct access. For example the production of a mobile application often requires specialized knowledge inputs that could not be immediately available in the company. KBS make it possible to access this knowledge relatively quickly through the market without having to build it up in one's own company.

The services supplied by KBS firms thus rely on professional knowledge or expertise relating to specific technical or functional domains, which can either be a source of information or form intermediate inputs in the products, services or production processes of other businesses (Windrum & Tomlinson, 1999, p. 392). Accordingly, KBS can play an important role for the innovativeness of companies in other sectors and for the innovation systems as a whole (Muller & Doloreux, 2009). K(I)BS can generally be defined as services “*that provide knowledge-intensive inputs to business processes of other organisations such as Computer services, R&D services, Legal, Accountancy and Management services, Architecture, Engineering and Technical Services, Advertising and Market Research*” (Miles, Belousova, & Chichkanov, 2018, p. 5).

The provision of KBS to organisations can, in principle, take place in several ways. Different institutional or organisational forms of the provision of professional services have developed historically under different economic and social conditions (Barley & Kunda, 2006). Today the majority of KBS are being provided either externally by Professional Service Firms or internally by so-called corporate or organisational professionals (Muzio, Ackroyd, & Chanlat, 2008). In both ways the people who provide these KBS are mainly employed and are part of an organisational hierarchy.

The traditional form in the provision of professional services although, has been the ‘solo practitioner’ who is self-employed and works either alone (sometimes with a small number of employees and/or family members) or with a limited number of associated partners in a partnership agreement (Pedersini & Coletto, 2010, p. 15). This way of providing professional services represents, so to speak, the ‘prototype’ of professional practice and has shaped the self-image of traditional liberal professions. To put it in the words of Hughes (1963): “*The true professional, according to the traditional ideology of professions, is never hired. He is retained, engaged, consulted, etc., by some one who has need of his services. He, the professional, has or should have almost complete control over what he does for the client*” (Hughes, 1963, p. 663).

Whether this ideal ever coincided with the actual reality of professional work remains to be seen. It should be noted however, that with the rapid growth of professional services and occupations during the 20th century organisational employment became the dominant form of professional practice. But with the rise of the digital economy we now see sort of a ‘revival’ of self-employment without employees in KBS sectors. In order to point out that iPros do not represent a completely new phenomenon they are also called sometimes “*second-generation independent workers*” (Bologna, 2018). They offer specific intellectual services in the KBS sectors on a freelancer basis and often collaborate with other individuals or organisations, but do not employ their own staff. Through their specific knowledge and skills, iPros contribute significantly to generate value for businesses by helping in the development and implementation of innovative products and services based on modern information technologies (Burke & Cowling, 2015).

2.2 The liberal professions and new expert occupations

The provision of KIBS is dependent on people who have the necessary expertise in specific knowledge fields. Traditionally, the (liberal) professions represented the social form in which

“expert knowledge” (in form of specific services) could be made available to the economy and society in general (Susskind & Susskind, 2015). A definition laid out by the Court of Justice of the European Union defines liberal professions according to activities ...

“Which, inter alia, are of a marked intellectual character, require a high-level qualification and are usually subject to clear and strict professional regulation. In the exercise of such an activity, the personal element is of special importance and such exercise always involves a large measure of independence in the accomplishment of the professional activities.” (Henssler & Wambach, 2014, p. 8)

This definition makes it clear that the liberal professions provide knowledge-based or ‘intellectual’ services, which have a strong personal character and require a high degree of independence or autonomy in the performance of these tasks. Historically, the exercise of a liberal profession has meant that one was self-employed and had to sell his or her service on the market and earn income from remuneration for their personal intellectual work (Hughes, 1960, p. 59). Independence and personal autonomy was regarded as a prerequisite for the personal provision of services for example in the medical or legal professions. This independence in the exercise of one’s profession was accompanied by a large number of legal regulations and restrictions, in particular with regard to access to the professions, professional organisation, supervision and obligations (Henssler & Wambach, 2014).

The development towards an informational economy, in which technological competence and knowledge have become central competitive factors, is closely linked to the emergence and spread of new knowledge-based or ‘informational’ occupations. In the second half of the 20th century or so we have seen new “expert occupations” (e.g. software developer, project managers, consultants) arise (Wyatt & Hecker, 2006). These new knowledge-based occupations were quite different from traditional “liberal professions” in their patterns of organization and delivery of expertise (Muzio et al., 2008).

Professional regulation, which is a classic characteristic of liberal professions, exists among the ‘new experts’, if at all only to a limited extent. Access to these new professional occupations is also hardly limited. Furthermore, the practice of new expert occupations usually does not require any predefined academic pathways and does not build on established knowledge stocks that are defined and prescribed by vocational organisations. The practice of these occupations depends rather on the individual abilities and relationships of the individual, which are sold in the form of a service either on the labour market or in the markets for goods and services.

Although, new expert occupations lack characteristic patterns of organisational or collegiate professions there are obvious similarities between traditional forms of professional work and new patterns of ‘expert work’ (Alvesson, 2001). Both can be categorized as ‘knowledge workers’ because they are involved in the production and dissemination of knowledge and information. In the traditional (liberal) professions as well as in new expert occupations people apply their “practical expertise” as a service to help their clients to cope better with specific problems or challenges (Susskind & Susskind, 2015).

This expertise comes in terms of advice or other symbolic actions and is grounded in a more or less systematic field of specialised knowledge (Hughes, 1963). Expertise in a specific field requires extensive training and substantial effort and devotion to the subject and is closely

connected to the work of peers. Different aspects of knowledge (e.g. technical, procedural, tacit) relate in complex ways to produce what is called “practical expertise” and which can be seen as the core of professional work (Susskind & Susskind, 2015).

The new expert occupations do not differ from the "traditional" liberal professions in the fundamental importance of knowledge or in the relevance of “practical expertise”, but rather in the way in which KBS are being provided. Thus, the difference is not in the professional specialisation or occupational organisation per se, but rather in the way in which KBS are being produced and made available to private or organisational customers. It is the “social form of professional practice” (Bologna, 2018, p. 199) that makes the difference between the traditional liberal professions and the new expert occupations. If the exercise of a traditional liberal profession takes place in a market environment, which is substantially different from the original professional context (e.g. the intellectual work is performed via an online platform), then the traditional professions can also be counted among the new expert occupations (Bologna, 2018, pp. 198-199).

3 Independent professionals (iPros) in Austria: Trends between 2004 and 2017

Solo self-employed persons working in KBS sectors and/or professional occupations are a growing part of the economy and the workforce around the globe. The following analysis is a first attempt to explore this group of self-employed workers in Austria and thus to see whether this group is growing here as well. To analyse the number of iPros in Austria over time and to see whether iPros are increasing numerically we draw on annual time series data from the Austrian Labour Force Survey (LFS). A continuous time series from the year 2004 to 2017 is thus available and forms the basis for the following analysis.

We estimate the number of iPros in Austria in two ways. We will first apply a sector-related characterization of own-account workers in KBS sectors (Mason, 2018) and then depict the numbers of own-account workers in skilled non-manual occupations (Kitching, 2015). This approach allows us to compare the estimates made by both definitions and helps to include a wide range of different iPros.

3.1 Methodology and data

The following analysis is based on data from the microcensus of the LFS, which is a quarterly sample survey collected by the Statistik Austria. The microcensus provides estimates of workforce numbers of the Austrian resident population. Around 22,500 households throughout Austria are surveyed each quarter. The microcensus is a sample with fifth rotation, which means that one fifth of households finishes the survey cycle every quarter and one fifth of new households begin it. Since the data is extrapolated, values with less than 6,000 persons are highly random and values with less than 3,000 persons are not statistically interpretable. This means that a reasonable analysis of self-employed workers at economic sectors (Ö-NACE) and occupational categorization (Ö-ISCO) is only possible at level 1 and in the occupational sub-major groups.

3.2 (Solo) Self-employment in Austria by economic sectors

The proportion of self-employed workers in the Austrian workforce has been relatively stable since the beginning of the 21st century. According to data from the LFS, the proportion of all self-employed workers in Austria was 11.4% in 2004 and has slightly shrunk to 10.9% in 2017. This is generally below the average of all 28 EU countries, which was 14.9% in the year 2015 (Eurofound, 2017, pp. 7-8).

Between 2004 and 2017, the number of self-employed people with employees ('employer') in Austria has risen by 37.300 (23,2%) while the number of self-employed people without employees ('own-account workers') has increased only by 10.000 (3.9%). That means that the proportion of the solo self-employed among all self-employed persons declined slightly from 61.5% in 2004 to 57.4% in 2017. The proportion of the solo self-employed in the total employed labour force in Austria has also dropped slightly from 7% in 2004 to 6.3% in 2017.

This slow growth in the numbers of self-employed without employees within the period under consideration gives the impression that solo self-employment is a relative stable employment category. But a closer look at the three economic sectors reveals that behind the aggregate numbers divergent trends are taking place. As Figure 1 shows, own-account workers have developed differently in the three economic sectors in Austria. While the number of own-account workers in agriculture and forestry has declined sharply since 2004 and the number of solo self-employed workers in the industry is also slightly shrinking, the number of self-employed workers without employees in the services has grown markedly.



Figure 1: Change in the numbers of types of self-employment in Austria, 2004-2017

A comparison of the self-employed without employees in the service sectors with their salaried counterparts (employees) in Table 1 shows that the solo self-employed persons in the service sectors is one of the fastest growing employment categories in the Austrian labour market. While salaried employment in the services is growing on average 1.5% per year, growth in own-account workers in services is on average over 2.5% per year.

Table 6: Employed persons by economic sector in Austria, 2004-2017

	Services			Industry and Commerce			Agriculture and forestry		
	2004	2017	avg-growth %	2004	2017	avg-growth %	2004	2017	avg-growth %
Employees	2230.6	2704.1	1.49	961.9	999.9	0.30	28.8	29.1	0.08
Own-account workers	127.9	177.3	2.54	27.5	22.0	-1.70	101.5	67.6	-3.08
Employers	112.6	138.6	1.61	34.4	38.7	0.91	13.9	20.9	3.19

This rapid growth of solo self-employment in the service sector since 2004 is an indication of an on-going transformation to a service economy. However, from this figure it is not clear which service sectors are driving the growth. Therefore, a distinction must be made between KBS and other service sectors to see if the growth comes primarily from knowledge-based or other services.

3.3 (Solo) Self-employment in knowledge-based service sectors

Self-employed workers in K(I)BS sectors can be specified and delimited in different ways. We define them according to an adopted list of knowledge-intensive service sectors provided by Eurostat (2016). This list has been crosschecked with other existing classifications of knowledge-based service sectors by Rapelli (2012) and Mason (2018). By using the (Ö-) NACE classification it is thus possible to estimate the numbers of the self-employed in different ‘intellectual’ service sectors. The following table lists those service sectors that fall under knowledge-based/intensive services and are referred here as knowledge-based service (KBS) sectors:

Table 7: KBS sectors by (Ö-) NACE code

(Ö)-NACE code	Business Type
<J> (58-63)	Information and Communication
<K> (64-66)	Financial and Insurance Activities
<M> (69-75)	Professional, Scientific and Technical Activities
<P> (85)	Education
<Q> (86-88)	Human Health and Social Work Activities
<R> (90-93)	Arts, Entertainment and Recreation

In comparison to Rapelli’s definition of iPros sectors, we slightly narrow down the scope of service sectors included and thereby limit them to business types proposed by Mason in his paper on Entrepreneurship in knowledge-based services. We have therefore excluded the sectors “Real Estate Activities (<L>”, “Administrative and Support Service Activities (<N>)” and “Other Service Activities (<S>)” from our delimitation of KBS sectors. In order to make a distinction between KBS and other service sectors, these sectors just mentioned, together with the sectors “Wholesale and Retail Trade (<G>”, “Transportation and Storage (<H>”, “Accommodation and Food Service Activities (<I>)” are here referred to as “Non-KBS” sectors.

The following figure (Figure 2) shows that the number of (solo) self-employed workers (own-account workers) in both KBS and NonKBS sectors in Austria has increased significantly since 2004, but to varying degrees. The number of solo self-employed workers in KBS sectors (iPros) has increased considerably during the period under review. In 2004 the number of iPros in Austria was 72.200 and has increased to over 100.000 people in 2013. Since then the number has never dropped under this limit. With an average annual growth rate of 3% this group has shown a remarkable growth trend over the period under review (see Table 3). The proportion of iPros among all solo self-employed people in all services grew also from 56% in 2004 to 60% in 2017. This means that iPros working in KBS sectors represent the majority of solo self-employed in the service sectors.



Figure 2: Change in the numbers of (solo-) self-employment in KBS and NonKBSs sectors, 2004-2017

The self-employed with employees (employers) are generally more strongly represented in the 'NonKBS' than in the KBS sectors. However, employers in KBS sectors show a stronger growth pattern over the entire period of observation. Employers in these sectors grew with an average annual growth rate of about 2% faster than employers in other service sectors (NonKBS), which grew only 1.4% per year on average (see Table 3). The share of employers in KBS sectors to all employers in the service sectors has thus increased also from 36% in 2004 to 38% in 2017.

Table 8: Average Growth (Solo) Self employment in KBS and NonKBS sectors

	Knowledge-based Services (KBS)			Other Services (NonKBS)		
	2004	2017	avg-growth %	2004	2017	avg-growth %
Employers	40.5	52.2	1.97	72.1	86.4	1.40
Own-account workers	72.2	106.0	3.00	55.7	71.3	1.92

From this preliminary results it becomes clear that since the beginning of the 21st century Austria has seen a substantial increase of self-employed professionals (in particular iPros) at the sectoral level. A more detailed analysis of sectoral differences should not be carried out here due to limited space. In the next section we will look at iPros through an occupational lens and will define them according to knowledge-based occupations.

3.4 (Solo) Self-employment in knowledge-based occupations

Knowledge-based occupations include those occupations that require specific personal skills and expert knowledge to perform the related tasks and duties. The (Ö-) ISCO-08 (International Standard Classification of Occupations) provides a standardized classification structure to group specific occupations according to skill level and specializations. It distinguishes 10 major occupational groups that are associated with different skill levels in terms of nature and duration of qualifications, training and work experience. The ISCO major groups 1 to 3 refer to 'Managers', 'Professionals' and 'Technicians and associate professionals'.

Kitching (2015) argues, that these three groups correspond broadly with skilled non-manual occupations and are therefore a possible criterion to demarcate 'freelance work' or knowledge-based work from other types of own-account working (Kitching, 2015, p. 17). Although managerial occupations (major group 1) could in the light of changing employment relationships (Wynn, 2016) be practiced in the form of solo self-employment, this is presumably the exception rather than the rule.

Since the change from the old occupational classification ISCO-88 to the new ISCO-08 the numbers for own-account workers in major group 1 ('Managers') are no longer recorded in the Austrian LFS, we will focus here on the ISCO major groups 2 and 3 and define (solo) self-employment in knowledge-based occupations according to the 'sub-major' groups in these two groups. The following table lists those occupations, which should be named here as KBS occupations. This classification corresponds to that of Mason (2018), who defines KBS occupational groups according to occupation codes from the US Bureau of Labour Statistics (BLS).

Table 9: Knowledge-based occupations by ISCO-08 code

Major Group	Sub Major	Occupation
<2>	<21>	Science and engineering professionals
	<22>	Health professionals
	<23>	Teaching professionals
	<24>	Business and administration professionals
	<25>	ICT professionals
	<26>	Legal, social and cultural professionals
<3>	<31>	Science and engineering associate professionals
	<32>	Health associate professionals
	<33>	Business and administration associate professionals
	<34>	Legal, social, cultural and related associate professionals
	<35>	Information and communications technicians

The change in the occupational classification system from ISCO-88 to ISCO-08 makes it necessary to draw separate time series for the years 2004 to 2010 and for 2011 to 2017. Because of regroupings in occupational groups the major groups are not directly comparable, but they show the change of numbers in these groups in the two time periods.

As shown in Figure 3 the number of solo self-employed professionals in academic occupations (ISCO-Class <2>) has risen considerably from 2005 to 2010 and from 2011 to 2013. After reaching peak in the year 2013 the number of iPros working in highly skilled jobs has remained constantly over 70.000. The number of solo self-employed professionals working in

associated professional jobs (ISCO-Class <3>) has also increased from 2004 to 2010. After the changeover from ISCO-88 to ISCO-08 the number dropped from nearly 68.200 to 46.200 because of regroupings.

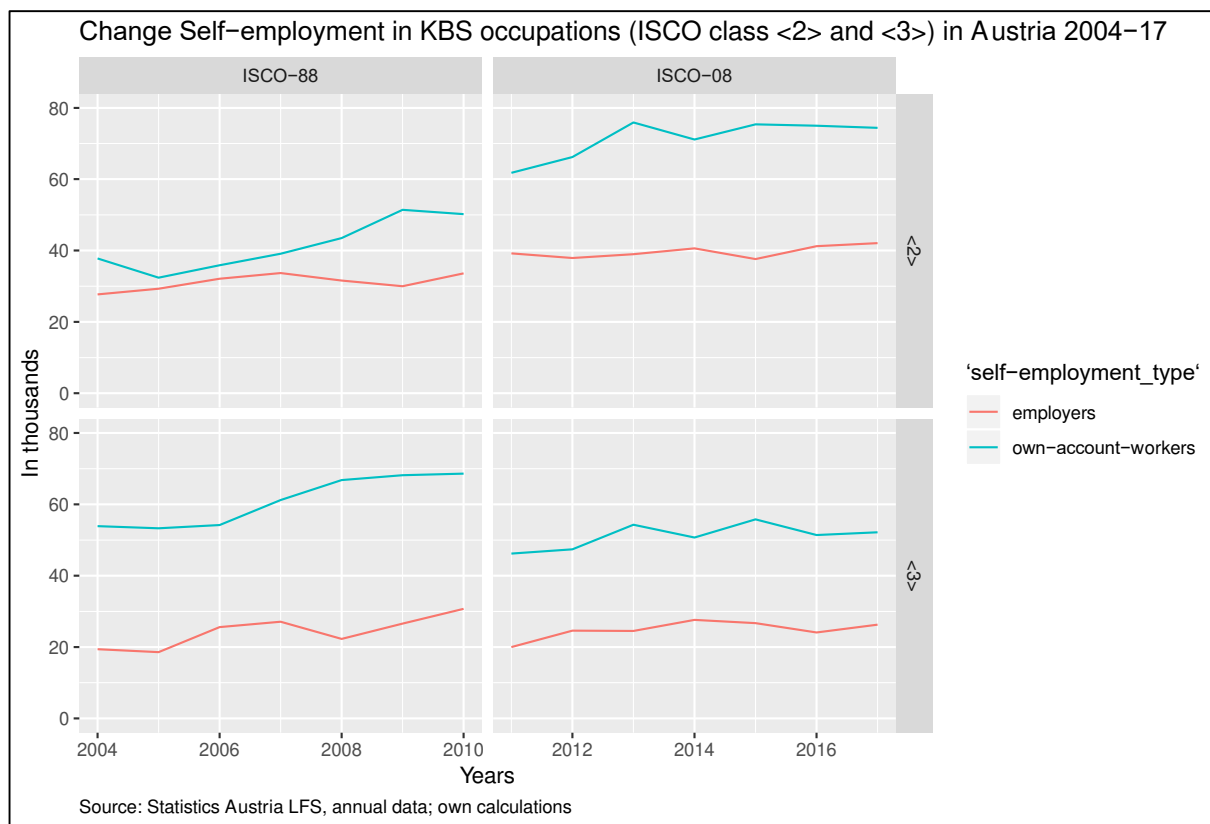


Figure 3: Change in the numbers of (solo-) self-employment in KBS occupations, 2004-2017

Accordingly, there has been a significant growth trend for iPros in both ISCO-classes over the two observed time periods. Although, with an average growth rate of 4.8% per year for the period between 2004 and 2010 and an growth rate of 3.1% for the period between 2011 and 2017 solo-self employed professionals in the academic professions are growing slightly faster than professionals in associated occupations, which grew by an average of 4.1% and 2.1% accordingly.

Table 10: Average Growth (Solo) Self employment in professional occupations

Type / ISCO-Class	<2>			<3>		
	2004	2010	avg-growth %	2004	2010	avg-growth %
Employers	27.7	33.6	3.27	19.4	30.7	7.95
Own-account workers	37.8	50.2	4.84	53.9	68.6	4.10
	2011	2017	avg-growth %	2011	2017	avg-growth %
Employers	39.2	42.1	1.20	20	26.3	4.67
Own-account workers	61.8	74.4	3.14	46.2	52.2	2.06

Conclusion

Highly skilled and educated individuals who work in KBS sectors and professional occupations are a major component of the economy in digital societies. They now constitute also a growing part of the self-employed workforce in Austria. Since the year 2004 the proportion of own-account workers in total Austrian labour force has been relatively unchanged. But this aggregated number conceals various changes in the sectoral composition of the self-employed workforce. While the number of own-account workers in farming and forestry has shrunk dramatically the number of solo self-employed in the service sectors has increased at the same time. To further explore these developments in the service sectors and to see whether this changes can be attributed to knowledge intensive sectors and occupations we analyzed the number of (solo) self-employment in KBS sectors and occupations over time.

As we have shown here self-employment in KBS sectors is growing faster than in other service sectors in Austria. Especially, the number of self-employed people without employees in KBS sectors has increased on average by 3% annually between 2004 and 2017, compared to 1.9% in other services. With regard to occupational classification we have also seen that the number of solo self-employed people in professional occupations has increased considerably since the beginning of the 21st century. These developments suggest that iPros or freelancers who work as solo self-employed experts are becoming an integral part of an informational or entrepreneurial economy and society (Audretsch, 2009). They work as “mobile, independent workers, selling specific services in external labor markets outside standard, organization-based employment” (Osnowitz, 2013, p. 1).

Although professional and knowledge-intensive (business) services (K(I)BS) have been identified as an essential part of competitiveness in knowledge driven economies (Ferreira, Raposo, Fernandes, & Dejardin, 2016) research in entrepreneurship on the specifics of these firms and their diverse forms of organizations is still limited (Landström, 2008). Recent research has shown that KBS businesses are different from other service providers and production companies in their entrepreneurial development and financial performance and thus need special consideration from educational system and policy (Mason, 2018).

In this paper we have taken both an economic sector-related and an occupational-related approach to trace the trends in the number of (solo) self-employed people in Austria over time. This approach has the advantage of inclusion of a wide range of different knowledge-intensive service sectors and also provides information of the skill and qualification level of self-employed service professionals. The findings in this paper can be seen as a first explorative approach to the further analysis of this emerging group in the labour force.

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Self-employment by Older People – Some Comments on an Often Overlooked Phenomenon

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Abstract: The aging and shrinking population in most developed countries is still seen as a major societal and economic problem. But the result of an ageing population is a growing number of healthy older people with human capital, financial resources, and time available to contribute to economic activities. However, the human capital of older people remains mostly unused. This rises the question, how to make use of the economic potential of older people. It will be discussed what factors may positively influence or hinder older people in becoming self-employed. Income and wealth situation, time sovereignty, work experience, previous occupations, health status, household context, but also the institutional framework are exploratory variables which may significantly impact the decision of the elderly. Overall, attention will be drawn to the relevance of older people in the field of business and entrepreneurial economics. Given the ageing population it seems necessary to focus not only on young people but also take into account the large and still growing economic potential of the elderly.

Keywords: Self-employment, older people, ageing society, entrepreneurship, senior entrepreneur

1 Introduction

The result of an ageing and shrinking population is a growing number of older people with a large amount of specific human capital, financial resources, and time available to contribute to economic activities. Therefore, an impressive economic potential of older people seems to exist. But overlooking the workforce, the human capital of older people remains for the most part unused despite that some people are working e. g. as volunteers or as senior experts. So, from an economic point of view the question arises, how to make better use of the underused economic potential of older people.

One way could be the promotion of volunteering. Though this would exploit only parts of the economic potential as volunteering is carried out by a specific part of the elderly, mainly by so called middle class people. Another option would be fostering self-employment. But self-employment of older people is an economic phenomenon which has been mostly overlooked in the past. For example, most economic policy programmes focus on the support of young entrepreneurs and start-ups. This follows the perception that young people are creative, innovative, and lateral thinkers. Numerous courses at universities, business schools etc. try to convince and prepare young people to take the risk of becoming self-employed and run their own businesses (Qian, Mulas, & Lerner 2018).

Therefore, the economic resources of older people concerning self-employment lie idle and are often overlooked. Older people are mostly seen as economic inactive or non-productive and only as a large mass of consumers, hence the term silver economy (European Commission 2015). Though fostering self-employment of the elderly may be a way to convince older people to become economic active through being self-employed. Those people may then stay in the labour force and generate economic growth. Yet little is known about the reasons and motives why older people become self-employed (Stypinska 2018; Organisation for Economic Co-operation and Development (OECD) & European Union 2017; Seco Matos & Amaral 2017; Caiger 2016).

Though to develop adequate political measures for facilitating self-employment in old age, it is necessary to know whether this is a serious option for the elderly. It is necessary to know the main factors which support self-employment of older people and what reasons may influence the decision of becoming self-employed in older age. Only when the main factors which explain self-employment of the elderly are identified, it is possible to develop policy measures to support self-employment of older people.

In the following it will be discussed what factors may influence positively or may have a negative impact on older people in becoming self-employed. For example, income and wealth situation, time sovereignty, work experience, previous occupations, health status, household context, but also the institutional framework are exploratory variables which may impact significantly the decision of the elderly. Additionally, main differences between younger and older people in becoming self-employed will be clarified.

Overall, attention will be drawn to the relevance of older people in the field of business and entrepreneurial economics. From an economic point of view it seems necessary to focus economic policy not only on young people but also on the economic potential of the elderly (Fachinger 2019). The aging population makes this even more important. But at first, it is necessary to take a closer look at the group, which in the following is referred to as older people or as the elderly.

2 Older People

There exists no commonly used definition of older people (Settersten & Mayer 1997). Normally the term refers to people who are in the life phase called old age, or -in economic terms- in the phase of diminishing productivity or in the post-productive life stage (Alwin 2012; Wogens & Reiter 2011; O'Rand & Krecker 1990). But this phase is in itself very heterogeneous. It is not clear at which calendar age the decrease in productivity will start as it depends on the mental and physical capabilities which differ tremendously even between people of the same age. Even at the age of 55 or older the productivity may increase. This is why in the literature of economics, sociology, psychology, biology, geriatrics, or gerontology different classifications of older people exist (Sachverständigenkommission zur Erstellung des Sechsten Altenberichts der Bundesregierung 2010).

However, in the context of this article the phase of old age starts with the transition into retirement. Older people are those, who have undergone the transition into the retirement

phase due to the age-related withdrawal from employment. Therefore, the beginning of this phase of life is (partly) determined by the age boundary as laid down in the pension law (Kohli 2007: 20 f.). In literature these people are referred to as the young, independent, active elderly or the young-olds, which are still vital and able to care for themselves. This phase ends with a noticeable increase in health and social risks. The very old or old-old people are more often in need of support or in need of care compared to the young-old people.

3 Characteristics of Older People

The group of older people has specific characteristics that set them apart from younger people, which are either in dependent work or self-employed. In the following these characteristics are discussed and encompass the income situation, the time sovereignty, and the experience from previous work and occupations (S. C. Parker 2018; Seco Matos & Amaral 2017). Additionally, the household context and the institutional framework has to be taken into account for analysing self-employment of older people (van Solinge 2015).

3.1 Income

Overall, the composition of income differs significantly from the situation in earlier life stages. One main characteristic of older people is that after retirement work is not necessary to earn a living. Because to retire means receiving benefits from statutory, occupational and/or private pension systems. What characterises older people is the dominance of income from pensions, whereas income from employment is less important.

Additionally, the entitlements constitute in principle also higher income security, depending on the specific pension system. Most pensions are a continuous stream of permanent income during retirement. As pensions replace earned income, the permanent income component is higher in absolute and in relative terms during the retirement phase compared to the employment phase. Additionally, it may be assumed, that usually the average income during the employment phase is higher than the average retirement income, but also the variance and hence the overall income mobility. Therefore, according to the μ - σ -criterion, it is unclear, whether the overall wellbeing during the employment phase regarding the income dimension is higher than during the retirement phase. Lower annual income does not necessarily mean lower economic wellbeing – it depends on the ratio of individual pensions to (previously) earned individual income, i. e. the replacement rate, and on the differences in the stability of the specific income stream during the two phases.

Considering all aspects on the income situation and its development over time, becoming self-employed after retiring means lower financial risk than becoming self-employed during the employment phase. The fear of failure would be less important for older people (for empirical evidence see e. g. Rehak, Pilkova, Holienka, & Jančovičová 2017). The higher income security constitutes *ceteris paribus* higher planning reliability and therefore a positive incentive to become self-employed after retirement, which is often ignored in the literature (e.g. Ahmad & Hoffmann 2012: 28).

3.2 Time Sovereignty

It can be assumed, that after retiring, people's time budgets are mostly not dominated by contractual obligations. During the employment phase, people normally have to work to earn

a living. This is done mostly in dependent work and under specific conditions. Despite the process of disintegration of work arrangements over the last couple of years due to the digitalisation—which inter alia leads to abandoning of work from time and place— people have to devote time to work. They may be free in their time regiments and may choose their place of work by themselves, but the process of hybridisation of work (Bührmann, Fachinger, & Welskop-Deffaa 2018; Bögenhold & Klinglmaier 2016) does not mean an overall reduction of working time. People have to invest time to work. However, in general the working hours normally decrease considerably after retiring and journey time to and from work places does no longer apply. There is not only more time available but this also creates more time flexibility. Retired people have more command over their time and can decide by themselves what they will do and when they will do it.

Furthermore, most people have entered the so-called empty nest phase (Heinze & Naegele 2010), a phase of live without having to care for their children, parents, or partners. Children are no longer at home, parents may not be in need for long term care, and care work for own partners has not yet begun.

Neither having to work nor caring for others creates free time with a lot of time flexibility, which has to be filled by other activities. People entering the retirement phase will be looking for meaningful actions to fill this time. This could be leisure activities, working as volunteers with less obligations, or as senior experts even abroad, or starting one's own business.

3.3 Work Experience and Previous Occupations

Older people who retire normally have a long employment history. Therefore, they have a lot of work experience and sometimes several previous occupations. This can be seen as positive factors for becoming self-employed (Solinge 2014). Older people have potential prior work experience in the relevant industrial sector that provides them with important background knowledge and the x's and o's of the sector in question. They exhibit a work career as dependent worker and/or have experience as self-employed and sometimes they even were serial entrepreneurs. The longer people work, the more experienced they become in what they are doing. Additionally, the closeness to previous work is relevant. The more people have worked in the specific area, in which they would like to become self-employed, the more specific experience they have gained and the more they know about the details and imponderabilities. Therefore, it may be assumed that older people can better foresee what they may experience when starting a new business. This may make it a lot easier to be successful.

Additionally, during their working careers, elderly may have developed networks which may ease the process of becoming self-employed. Network partners might support the idea of working after retirement and may help by keeping the contacts or relationships intact and may even place an order.

3.4 Health Status

One main reason for the demographic change is the increase in longevity of people in more developed countries. The discussion, whether the additional live years will be in good health status—compression of morbidity theorem (Fries 1980; Fries 1991; Fries, Bruce, & Chakravarty 2011)— or whether the phase of bad health status will be prolonged due inter alia to new

medical technics –morbidity theorem (Verbrugge 1989; Verbrugge 1994)– relates more to the older people in advanced age (M. G. Parker & Thorslund 2007).

It may be assumed that overall after retiring people on average are in good health conditions and therefore are able to run a business. Additionally, retired people can choose the field in which they want to become self-employed in dependence of their health status. The process of digitalisation may open up opportunities to become self-employed even for people with restricted health. Regarding all this it can be assumed, that the status of poor health may have less negative influence on the decision to become self-employed in future.

However, at present the effect of the health status is unclear as there is a lack of empirical evidence or contradictory results (Zissimopoulos & Karoly 2007; Zissimopoulos & Karoly 2009; Wenger & Reynolds 2009; S. C. Parker & Rougier 2007).

3.5 Household Context

As long as people do not live alone, their decisions are made in the household context. This means that not only the individual characteristics but also the characteristics or type of household should be taken into account when analysing self-employment by older people. The types of household can be distinguished in three categories:

- household structure
including all qualitative social characteristics; for example, the way of living together, occupational status, degree of autonomy of the household members, etc.
- household composition
qualitative demographic characteristics such as age and gender of the household members
- household resources
quantitative household characteristics; for instance, number of persons, who are living in the household, number of employed persons, household income, wealth situation etc.

However, it can be assumed that older people who are or want to become self-employed are supported by their household members. It may even be the case, that a hybrid model of household-business-complex will take shape where business and household activities are intertwined. This applies, in particular, to those activities that are done as home-based work, as small business, or as freelancers. The options for such forms of self-employment are due to the process of digitalisation and the structural changes of the labour market on the whole characterised inter alia by the term platform economy (Bührmann et al. 2018).

3.6 Institutional Framework

The institutional framework and legal regulations are important factors which affect self-employment by older people (Abdesselam, Bonnet, & Renou-Maissant 2017: 9 ff.; Ahmad & Hoffmann 2012: 22 f.; van Solinge 2015: 106 f.). These exogenous factors are mostly overlooked in economic analysis and typically included in the ceteris paribus assumptions or not even mentioned. A classic example is The Gallup Organization 2007, where people of 55 and older are gathered in one single group, totally ignoring their heterogeneity.

To give an example of the relevance of the institutional framework in analysing self-employment of older people, the legal retirement age has to be discussed. In principle, the legal retirement age determines the end of the employment phase and implies the termination of dependent and –depending on the occupation– of independent work. Even in one country such regulations are neither constant over time nor invariable between occupational groups or industrial sectors (Directorate-General for Employment 2018; van Solinge 2015: 107).

There exist different retirement ages for dependent workers and self-employed people. In Germany for example:

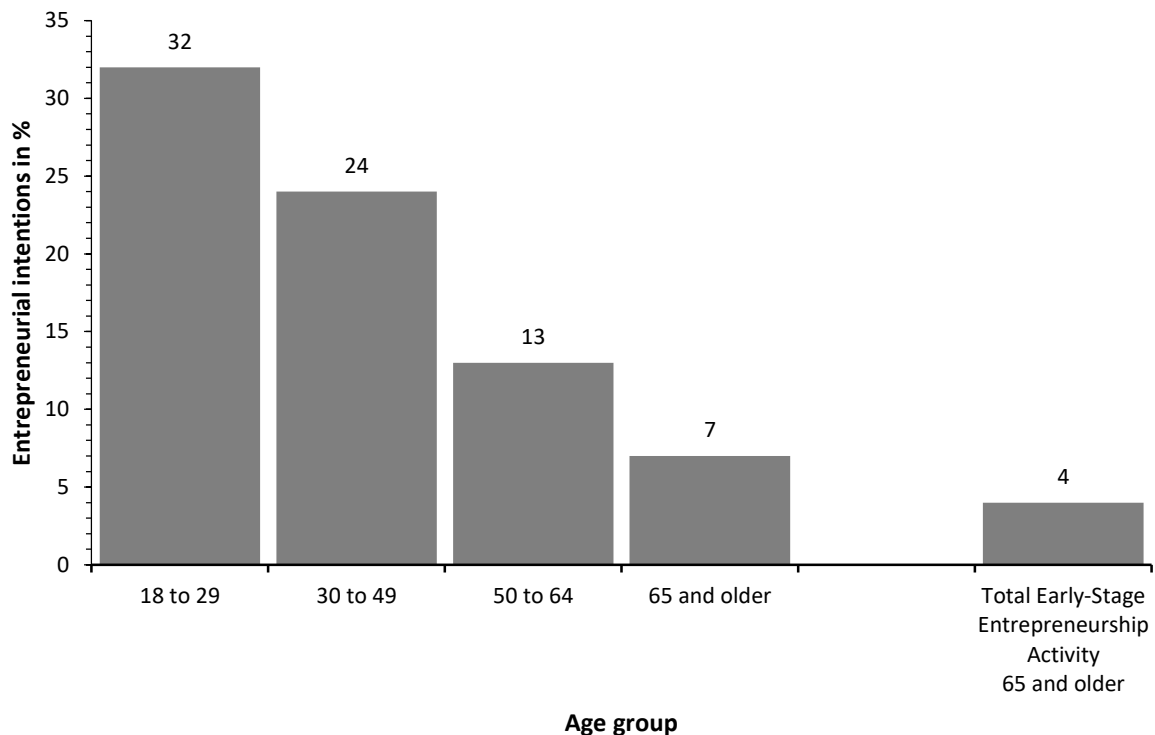
- The normal retirement age for employees with compulsory insurance is 67 (§ 35 Sechstes Buch Sozialgesetzbuch - SGB VI). But people can retire earlier –if they met specific conditions– or work longer. After having been insured in the statutory pension system for at least 35 years one can retire after reaching the age of 63 (§ 36 SGB VI) but for each month earlier than 67 the pension will be reduced by 0.3 % per month (§ 77 Abs. 2 Nr. 2a SGB VI). With a qualifying period of at least 45 years, people can retire after reaching the age of 65 without any reductions (§ 38 SGB I).
If in the statutory old age pension system compulsory insured people work longer than the age of 67 in agreement with the employer, their pensions will increase by 0.5 % per month (§ 77 Abs. 2 Nr. 2b SGB VI).
- The normal retirement age for civil servants of the Federal State (not for the public sector workers, which are compulsory insured in the statutory pension system) is also 67 (§ 51 Abs. 1 Bundesbeamtengesetz). But the retirement age for civil servants which work in the fire services of the German Armed Forces is 62 (§ 51 Abs. 3 Bundesbeamtengesetz) as is the retirement age of ordinary professional soldiers (§ 45 Abs. 1 Soldatengesetz).
- The normal retirement age for civil servants of the Bundesland Berlin is 65 (§ 38 Landesbeamtengesetz Berlin).
- Until 2006 the official retirement age of physicians was 70. With respect to the structural socio-demographic changes this age limit was abandoned so that physicians can now practise till they die. Such amendments of law result in cohort effects as they apply as of a certain point in time.
- Notaries have to retire at the end of the month, when they became 70 (§ 48a Bundesnotarordnung).

All these legal regulations influence the decision and constitute age differences regarding the opportunity to become self-employed.

4 Empirical findings on the intention to become self-employed

To get a general impression whether self-employment is an option for retired people, some information is given on the basis of the Eurobarometer (European Commission & TNS Opinion & Social 2012) and data from the Global Entrepreneurship Monitor (Amorós & Bosma 2014) in the following. However, by interpreting the results, it has to be taken into account, that the two surveys are not comparable if only for different survey structure, questionnaire design, and differing wording of questions.

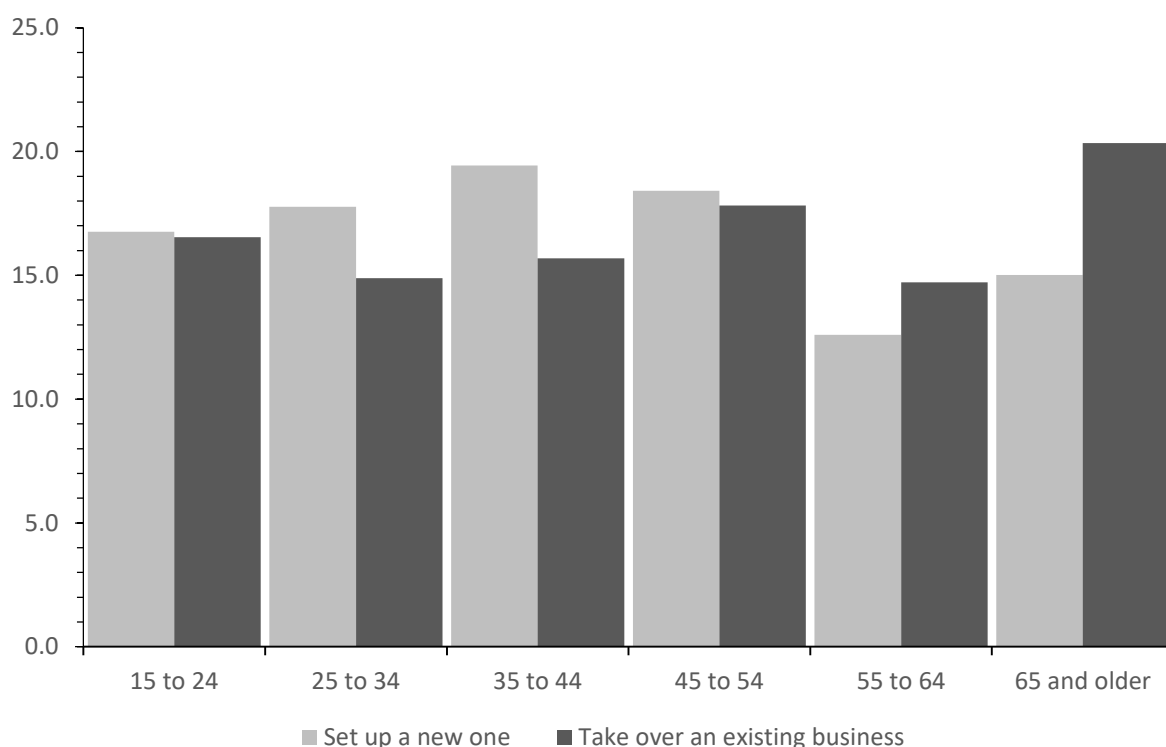
Overall, it seems that at least some older people are interested in starting up a business, as can be seen in Figure 1, where the overall entrepreneurial intention by age groups is shown. At least 7 % of the interviewees in the age group of 65 and older have such intentions and around 4 % of people from this age group have undertaken early-stage entrepreneurship activities.



Source: Schøtt, Rogoff, Herrington, & Kew 2017, p. 22.

Figure 1: Entrepreneurial intentions, in % of the age group, GEM 2009 to 2016

In the Eurobarometer, people are asked “Q17: If you currently had the means to start your own business, including sufficient funding, would you rather set up a new one or take over an existing one?”. The answers reveal differences between the age groups, which are shown in Figure 2. In general, older people seem more inclined to take over an existing business than to set up a new one in comparison to other age groups (Ainsworth & Hardy 2008). Taking over a business may be easier and less risky as people do not have to have a new business idea, innovative products or services, and may increase the chances of economic success because of the combination of experiences, skills and networks of older people and those of the enterprise and its employees (Organisation for Economic Co-operation and Development (OECD) 2012).



Source: Own calculations on the basis of Eurobarometer 2012.

Figure 2: Set up a new business or take over an existing one, in % of the age group, Eurobarometer 2012

Therefore, it is not surprising, that few older people are involved in an early-stage of implementing their business idea as own calculations on the basis of GEM 2015 indicate. The indicator for such activities is called Total early-stage Entrepreneurship Activities (TEA) which is measured as the “percentage of the adult population that are in the process of starting or who have just started a business” (Schøtt et al. 2017, p. 22).

Of all people, which are participating in early-stage entrepreneurial activities, a TEA of 3.6% belongs to the age group 60 to 64 and the TEA for people 65 and older is 1.4%. However, 5.5 % of the age group 60 to 64 and 3.8 % of people 65 and older are active in the field of early-stage entrepreneurship.

Overlooking the empirical information on the potential for entrepreneurial activities of older people, it seems as if there exists a sufficiently large number of elderly who are inclined to become self-employed.

5 Summary

In the face of an ageing and shrinking society with an increase of longevity, the number of older people, who are equipped with high economic potential but no longer participating in the labour market, is growing (European Commission 2014; Carone, Eckefeldt, Giamboni, Veli, & Pamies Sumner 2016; European Social Insurance Platform (ESIP) 2010). It is often argued that this will lead to a financial collapse of the social security systems, especially of the

statutory old age pension systems. Therefore, the question arises how the economic potential of the elderly, especially retired people, can be used. One possibility is starting a new professional career as entrepreneur or self-employed. To develop adequate economic measures for supporting the elderly in the choice for self-employment, the main factors have to be identified. In this context, it is discussed, that the income and wealth situation, time sovereignty, work experience, previous occupations, health status, household context, but also the institutional framework may have a significant impact the decision of the elderly to become self-employed. Furthermore, it is shown, that older people –if only a small part– could imagine to become self-employed or are in the phase of early-stage entrepreneurship. Overall it seems worthwhile to have a closer look at the elderly when fostering self-employment, taken into account their specific circumstances such as secure income out of pension systems, time sovereignty, and work experience. Additionally, the institutional framework as well as the household context have to be considered, as regulative, legal and institutional conditions set the framework for individual decisions, which are taken within the household context and often discussed with family members.

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SELF-EMPLOYMENT IN THE CEE AND THE EU15: QUALITY WORK, PRECARIOUS WORK, OR BOTH?

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Abstract

This study contributes to the debate on whether self-employment provides quality work and for whom. It examines the differences in earnings between self-employed and employees in the CEE and the EU15 countries. The study uses the standard Mincerian earnings framework and quantile regression methods. The data comes from the 2014 wave of EU SILC dataset, which provides comparable data for a representative sample of individuals in the EU28. In both groups of countries, self-employment pays more than regular employment only for workers at the top of the distribution and significantly less for those below the median. In the CEE, these differences are lower at the bottom of the distribution, which likely reflects lower wages and employment protection for regular employees in the CEE. The paper also examines these differences for highly skilled occupations, where self-employment is driven largely by technological opportunity, and finds a similar pattern. The results show the co-existence of necessity and opportunity self-employment and highlight the need for a nuanced policy that responds to the needs of both groups.

Keywords: self-employment, entrepreneurship, income distribution, quantile regressions, transition economies.

JEL Codes: L26, D31, J24.

This paper has been withdrawn at the request of the authors.

Self-employment, Knowledge and Hybrid Labour in the Gig-Economy

Dieter Bögenhold* , Robert Klinglmair** and Florian Kandutsch**

Abstract

In a framework of changing contextual factors, this paper deals with one-person enterprises as the smallest units of entrepreneurial companies, which already represent more than 50 % of Austrian companies. Within these micro-enterprises a special group of self-employed can be identified at the blurred boundaries between dependent work and self-employment: the hybrid solo-self-employed, which are primarily operating as a sideline business. These hybrid forms enormously differ from regular entrepreneurs that perform their self-employment as main business. Based on an own empirical survey, the paper aims to examine whether hybrid entrepreneurs are a homogeneous group or if there exist differences with respect to their human capital. Our findings reveal several differences concerning for example (dependent and self-employment) income, working hours or main workplace. Summarised it can be stated, that education matters when looking at different aspects of hybrid self-employment activity.

Keywords: structural change, labour market, gig economy, self-employment, entrepreneurship, hybridity, human capital

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Introduction: Change as the only Constant

The philosopher Heraclitus of Ephesus was right. Centuries before the start of our modern Christian computation of time, he claimed that everything is changing and nothing stands still. Speaking of capitalistic societies, Joseph Alois Schumpeter stated back in 1942 that capitalism must be seen as an evolutionary process, which, by its nature, never can be stationary. Societies are in a flow. They are constantly changed by the time due to the 'products' of the society in a given period of time. Nowadays, of course, things are also changing. A technological revolution centred on information and communication technologies has reshaped and still is reshaping the fundamental basis of our society.

So, as time marches on, the institutional settings of societies are in a transitioning process altering the foundations of the very same societies. Nowadays, this transitioning is accelerating from period to period due to major achievements in modern information and communication technologies. As labour markets are closely linked to the settings of societies, they are also facing massive structural changes, which affect the composition of labour markets and, in particular, the self-employed part thereof. One section of the paper will take a closer look at the changing contextual factors with a focus on implications for the labour market, in particular for the (solo-)self-employed. This paper deals with a special group within the sector of self-employment, which is receiving increasing interest from scholars in that field: the hybrid (solo-)self-employed. Within this group, we are facing a great heterogeneity with respect to different aspects and we can see a rise of blurred boundaries between dependent work and self-employment. The majority of the self-employed are working as a one-man- or one-woman-firm, which raises the need for challenging established views on self-employment and entrepreneurship. Why it is fruitful to engage in a discussion about stereotypical views of the self-employed or of entrepreneurs will be an important concern the paper deals with.

The overall aim of this paper is to examine differences within the special group of solo-self-employed persons belonging to the hybrid category. A special focus in this paper lies on differences with regard to their educational background. Based on an own empirical study, findings reveal that there are differences with respect to the different educational level. The empirical part of the paper takes up several of these findings and tries to discuss them within a framework of great heterogeneity that underlies this group. As starting point for our discussion, the first part of the paper gives attention to the development of self-employment in the 20th century.

1. Decline, Stabilization and Rise of Self-employment

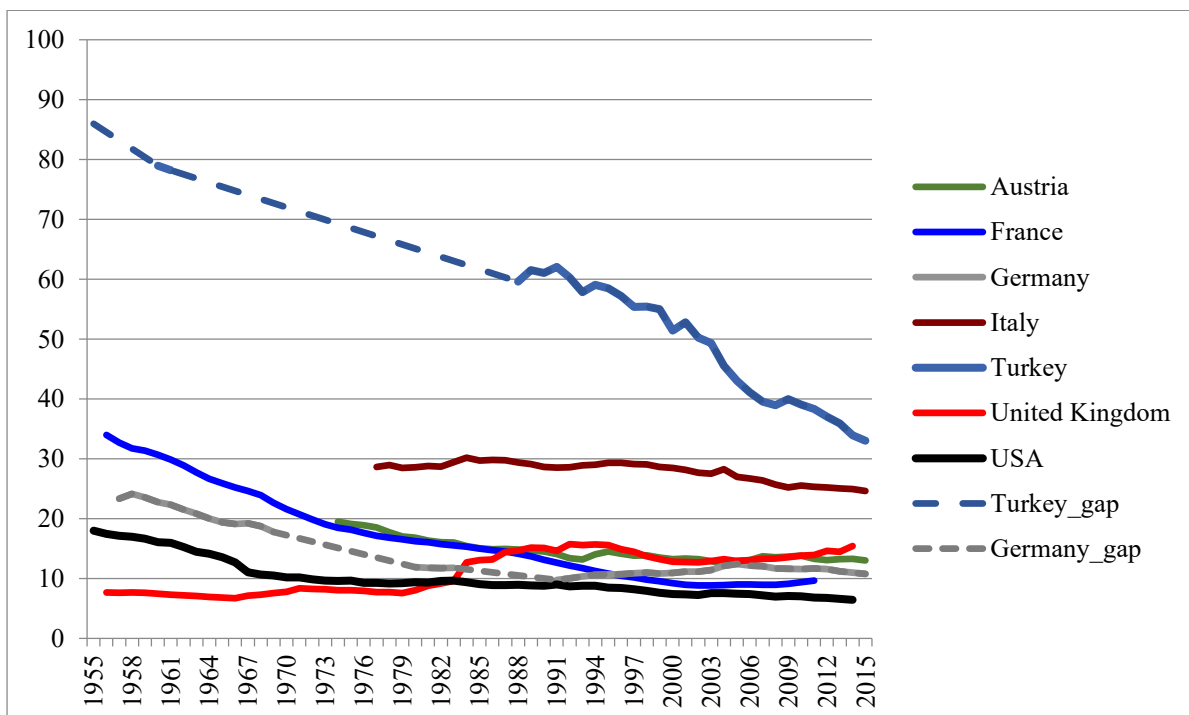
The 20th century was the century of the establishment of contractual labour in the modern form, where wage- or salary-dependent work is characteristic for the great majority of people in the employment system. People are formally free entities who can enter into contracts on the basis of existing rules of labour laws, although this freedom will be limited through the power of offer and demand in the labour market. If the individual has no alternative other than to accept a specific contract offer, factual freedom is fairly limited, because choices are

few. The establishment of rationality within such a contractual society is portrayed in Max Weber's reflections on sociology of law (Weber, 1978). The 'iron cage' (Weber, 2003) is based upon technological efficiency, control and rational calculation and can also be described, in the words of George Ritzer (1993), as McDonaldization of society. Hand in hand with the rise of industrial capitalism and the establishment of the historically new contract system including labour laws and social security and welfare rights went the rise of mass production.

In parallel with the rise of mass production, modern societies experienced a secular decline of self-employment within nearly all OECD countries during the 20th century. Much of this decline goes back to the decline of employment in agriculture due to the enormous productivity increase achieved in the agricultural sector. Research on institutional factors (Acs et al., 1992; Staber and Bögenhold, 1993) has indicated a variety of components, which influenced the ratios of self-employment. Especially, the relative ratios of unemployment stay in direct connection with self-employment ratios. Cross-national research for a series of different OECD countries showed that an upsurge in unemployment was always responsible for an upswing in self-employment ratios for a time span of several decades (Bögenhold and Staber, 1991).

The historical decline of self-employment has come to a relative standstill or even a slight revival since the 1980s, although different countries show different patterns of concrete development. For a series of selected OECD countries within an observation period of 1955-2015, Figure 1 indicates that the direction of development coincided between most of the countries, although the relative levels of departure and of change differ:

Figure 1: Ratios of Self-employment in OECD Countries from 1955-2015



Source: OECD (2017); own calculations

Looking at self-employment, ratios show a specific level of self-employment within a specific time, but this view hides the fact of inter- and intragenerational social mobility behind the figures. Figure may remain the same, while at the same time multiple inflow and outflow

dynamics are taking place. Sociological stratification and mobility research shows the high dynamics between wage dependent work and unemployment on the one side and self-employment on the other. In other words, self-employment as a category continuously receives fresh blood and loses old blood through 'underground mobility'. The labour market dynamics and social mobility patterns are of great interest to researchers focusing on the division of occupations and related dynamics in the economy (Arum and Müller, 2004).

Empirically divergent paths and logics of people moving towards self-employment must be taken into account so that not only one typical manner of recruitment is visible, but *several* different types, each with competing social logics. In contrast to stereotypical assumptions, the phenomenon of self-employment may look entirely different when it is studied as a phenomenon embedded in the labour markets and specific occupational contexts, applications and sectors. Some types of small businesspersons and independent professionals belong to a category, which does not fit with an image of entrepreneurship (Burke, 2011; Burke and Cowling, 2015). They do not show ambitions for growth and they operate in routines, which are sometimes very close to low income ranges, occasionally to poverty (Shane and Venkataraman, 2000). Empirical studies on diverse groups of self-employed individuals in larger societal and labour market contexts may produce alternative pictures, challenging stereotypical assumptions and types of rhetoric related to self-employment and independent business (Blackburn and Kovalainen, 2008; Kautonen et al., 2010; Bögenhold and Fachinger, 2013; Cieslik, 2015; van Stel and de Vries, 2015).

2. Digitalization and the Gig Economy: Changing Contextual Factors

Behind the regular development of ups and downs of self-employment, one has to acknowledge secular trends towards a shrinking of employment in agriculture and a deindustrialization of economies and societies, which leads to an increasing weight of employment in the tertiary sector. According to OECD data on labour force statistics (OECD, 2015), nowadays between 75 % and 85 % of the total labour force is engaged in labour in the tertiary sector, whereas in the middle of the 20th century only between 30 % and 45 % of the labour force was located here. According to this, the vast majority of people in the employment system is no longer engaged in manufacturing or primary production, but is associated with some kind of post-industrial production (Bell, 1973). Of course, even the tertiary sector is very widespread and Bell (1973, chapter 1) added a quaternary (trade, finance, insurance, real estate) and quinary sector (health, education, research, government, recreation) in order to highlight different segments of the so-called post-industrial society.

In a historical time span looking at the last century, if not centuries, we can see a decisive change of the social landscape of human life. Among other historical significant developments, are especially those of peculiar interest that are centred around innovations regarding information technologies and have constituted a new technological paradigm. This innovations have reshaped and still are reshaping our society and everything which is interconnected with it. (Mokyr, 2002; Jin, 2016). Due to the fact that we are living in a capitalistic society, which is characterized by nature as never stationary (Schumpeter, 1942), we are always facing transitions. However, the remarkable point nowadays is the pace at which this overhauling process of the capitalistic system itself can be observed. One of the earliest and most central insights of economic science was that continuous development involves structural change (McCloskey, 2010). Besides many other important implications

caused by this general overhauling, the changing structure of the labour market is of particular interest (Castells, 2010).

The digitalization of economic activities and the emergence of newly networked enterprise units resulted in shortening time per operation and accelerating the turnover of resources. New management techniques have changed and increased the speed of financial transactions to hours, minutes and seconds due to the availability of new information technology, with which well-defined software and programs can generate losses or gains by quasi-instantaneous decisions (Jin, 2016). What truly matters for every social process and form is the actual interaction between modes of development and modes of production ('living flesh of societies') enacted by social actors in often unpredictable ways within a framework of past history and current conditions of technological and economic development, surrounded by great uncertainty (Mokyr, 2002; McCloskey, 2010).

The most decisive factor (historically) accelerating, channelling and shaping the information technology paradigm was/is the process of capitalist restructuring undertaken since the 1980s. This process led, in a nutshell, to a series of reforms (deregulation, privatization and dismantling of the social contract between labour and capital). Four goals were pursued: (1) deepening the capitalist logic of profit seeking in capital-labour relationships, (2) enhancing the productivity of labour and capital, (3) globalizing production, seizing the opportunity of the most advantageous conditions for production and (4) marshalling the state's support for productivity gains and competitiveness of economies. Without the new information technology, the capitalist restructuring would have been much slower, with much less flexibility (Castells, 2010). When we speak of the 'informational society' and the new semantic of a 'gig economy', we have to acknowledge that these societies are capitalist societies and that they always experience some degree of cultural and institutional diversity.

The shift to a tertiary, quaternary and quinary economy went hand in hand with the transformation of the structure of occupations, education profiles and the division of firms. The fourth logistical revolution brought new competitive factors (Andersson and Andersson, 2017) including new communication networks, cognitive skills, creativity in scientific research and R&D, complexity of goods/services, and new forms of education, further education and work contents. Deming (2015) shows for the U.S. the change of required job skills in a period from 1980 to 2012, when the component of social and mathematical skills has increased in different compositions but steadily.

When we discuss level, quantity and quality of recent work profiles we must also take into account that new phenomena are appearing due to new technological possibilities in the gig-economy, first of all crowdwork and 'work on demand via apps'. Crowdwork is work that is "executed through online platforms that put in contact an indefinite number of organisations, businesses and individuals through the internet, potentially allowing connecting clients and workers on a global basis" ... while 'work-on-demand' via apps refers to "jobs related to traditional working activities such as transport, cleaning and running errands, but also forms of clerical work, are offered and assigned through mobile apps" (de Stefano, 2015). Of course, the last group is not homogeneous and the most relevant distinction can be drawn between apps that match demand and supply of different activities such as cleaning, running errands, home-repairs and other apps that offer more specialised service such as driving, or even some

forms of clerical work such as legal services or consultancy (de Stefano, 2015, 2-3; also Aloisi, 2015).

3. Solo-Self-employment as a Case of Self-employment

Contextualizing the object of investigation (Welter, 2011) implies to acknowledge that the change to the service sector in general and to digitalization in particular fosters the relative trend to smallest units of self-employment (Cieslik, 2017). Especially when talking about the organization of firms, many contemporaries forget that the vast majority of firms consists of small and medium-sized units. Additionally, among these, most belong to the category of smallest firms, where the owner operates as one-man- or one-women-firm, where the owner is identical with the firm and vice versa (Wynn, 2016). Furthermore, many freelancers are located in this group, where they are statistically not always counted as firms, but belong to the group of self-employed occupations.

As Table 1 indicates, the share of solo-self-employed people is remarkably high in regard to the total amount of self-employed persons. In this table, only few member states were picked to show the relevance of solo-self-employed, but it should be stated here that no country within the EU has a share below the 50 % mark, while the average for the European Union is even higher than 70 %.

Table 1: Share of solo-self-employed persons in selected EU member states

<i>EU member state</i>	<i>share of self-employed in %</i>
EU average	71.44
Romania	93.45
United Kingdom	83.40
Lithuania	79.33
Czech Republic	78.95
Netherlands	75.32
Italy	71.77
Spain	70.72
France	61.38
Austria	59.88
Germany	54.75

Source: Eurostat-Database (2016a); own calculations

Interpreting new markets as a complex result of occupational changes at a macro level and social mobility within the biographies of individual agents, gives an idea of how changes serve as sources of newness. The existence of new and – at least initially – small firms is nurtured above all else by the shift in the economy towards the service sector (Castells, 2010). First of all, new occupations and job profiles are emerging; these are then in turn associated with the emergence of a multiplicity of new self-employed occupations and job profiles. The

significance of the growth in professional services for the future of self-employed activity is revealed by a glance at the trend in those occupations, which belong primarily to the segments of business services and education, health and culture. Principle changes in society provide a basic ground for new areas of independent liberal professions as well as for new firms in the service sector, especially when the so-called creative industries (Florida, 2002; Flew, 2012) also become a domain of professional expertise and when trends of globalization and company strategies of outsourcing interact (Oshri et al., 2008; Bharat, 2012).

Due to increased recent trends of dynamics and related flexibility and uncertainties, people show up in the cloak of self-employment who are sometimes just de facto labourers without social security benefits (Kalleberg, 2011). On the other hand, due to secular changes in lifestyles and values an increasing number of freelancers is emerging, who just want to work on their own without being involved in hierarchies (Hytti, 2005), not only but often in the growing IT sector (Shevchuk and Strebkov, 2015). Independent liberal professions are definitely not regarded as 'core entrepreneurs'. Bögenhold et al. (2014) have shown that even between different sections of freelancers in Finland sometimes huge differences in labour market behaviour and life-attitudes exist (for the context of the UK see Burke, 2011, and Kitching and Smallbone, 2012). Some types of small businesspersons and independent professionals belong to a category, which does not fit with the traditional image of entrepreneurs as risk-takers and innovators. They do not show ambition for growth and they are sometimes very close to low income ranges, occasionally even to poverty (Bögenhold and Fachinger, 2016). Empirical studies on diverse groups of self-employed individuals in larger societal and labour market contexts produce alternative pictures, challenging stereotypical assumptions and rhetoric related to entrepreneurship. They highlight the heterogeneity of the occupational category of self-employment.

Findings reveal that the life and work situation of self-employed and liberal professions cannot be interpreted in simple black and white schemes, such as 'close to poverty' and pushed by missing employment chances into the sector of waged work on the one side versus working without hierarchies and being independent and self-realized on the other side. Instead, many different socioeconomic situations can be found 'in between', which are driven by different social logics. However, looking at the margins of the economy contributes to challenging some stereotypes of self-employment or entrepreneurship (Friedman, 2014). McKeown (2016) has shown that the actors are often not entirely certain about their own classification. Their self-definition oscillates between entrepreneur, self-employed person, consultant, independent professional (I-pro) or just contractor. It is not always clear, if we have to speak about a professional contractor or an independent professional (Johal and Anastasi, 2015). Self-employment is very often a biographical period and takes the form of being a social process within a life-course (Mayer, 2009; Kohli, 2007).

Especially being in a so-called entrepreneurial society (Audretsch, 2007) must be furnished sociologically: In doing so, we also have to acknowledge a variety of 'non-standard' forms of self-employment, including part-time self-employment, self-employment just for brief periods, freelancers and other different sectoral activities (such as, e.g., farmers). Full-time working freelancers, farmers, micro-entrepreneurs without employees, and 'big' entrepreneurs employing a larger share of wage- or salary-dependent employees are difficult to summarize in one single box. The black and white dichotomy of being dependent or self-employed seems to neglect the multiplicity of inflow and outflow processes, which take place

constantly behind the aggregate figure and which are very often related to complex processes of individual attempts to increase the social status. Therefore, those new forms of self-employment are difficult to define, since parts are pushed out of necessity while others are pulled and a sign of choice; parts belong to the new gig economy, while others work in comparatively traditional sectors (McKinsey, 2016). Last, but not least, we are experiencing the phenomenon that people fall into more than one box, they are self-employed and wage- or salary-dependent employees simultaneously.

When dependent workers and independent actors sometimes have overlapping identities, we may call them hybrid entrepreneurs (Folta, 2007; Folta et al., 2010; Raffiee and Feng, 2014; Schulz et al., 2016). While 'die-hard entrepreneurs' (Burke et al., 2008) are those actors, who are primarily portrayed in public discourse and in economic literature, namely those actors who are dynamic, willing to expand and to take risks, hybrid (self-)labourers seem to be of a different nature. The empirical study to discuss further is concerned with those hybrid forms of self-employment. Especially, following previous own empirical findings, we will explore if qualification matters when dealing with positive or negative aspects of hybrid self-employment.

4. Empirical Findings on Hybrid Self-Employment: Does Human Capital matter?

In Austria, the category of solo-entrepreneurs accounts for 59.9 % of all self-employed according to Eurostat-Database (2016a, 2016b). The share of solo-entrepreneurs within total self-employment in the EU-28, by contrast, accounts for 71.5 % (Eurostat-Database, 2016). Even though Austria is below the EU-28 average, we can see the importance of micro enterprises without further employees accounting for far more than the half of all self-employed people. Moreover, Austrian statistics indicates the significant relevance of enterprises led by one man or woman. The Austrian public census of company units shows that 322,889 firms are led by a solo entrepreneur, representing 61.8 % of all firms located in Austria (Statistik Austria, 2015). A lower level of solo-self-employed is presented by the Austrian Chamber of Commerce ('Wirtschaftskammer Österreich'; WKO). This is caused by the exclusion of a variety of types of freelancers, which do not have to be registered in the chamber. WKO data show a share of one-person-enterprises, compared with the total number of enterprises registered, which amounts to 58.9 %. In absolute figures, the WKO counts 290,061 units of solo-self-employed persons in the whole of Austria. Compared with the previous year, the figure of solo-self-employed people has risen by 4.2 %. If we look at the federal state of Carinthia, which is of interest in our empirical section, 18,097 one-person-enterprises are listed in the register of the Austrian Chamber of Commerce. The share of microenterprises without further employees amounts to 57.3 % for Carinthia, which is a little below the Austrian average. More than 60 % among all solo-firms have their domains in the business and craft sector, as well as in the information and consulting sector. Also, the trade sector, with a share of 48.5 %, has a high ratio of solo-firms (Wirtschaftskammer Österreich, 2015).

After the evaluation of data from official European and Austrian statistics, we can see that one-person-enterprises play a very important role in the European and Austrian business sector, since they make up the majority of enterprises. However, there is a lack of information about the group of hybrid-entrepreneurs. The group of hybrids are those firms where the owner has more than one activity. The question we raise is how the education of those hybrid-

entrepreneurs accounts for differences emerging. Are there serious differences within this group, if we look at the educational background and if yes, where do they emerge? In order to answer the questions, a broad online survey was implemented in cooperation with the Carinthian Chamber of Commerce. The survey is based on a questionnaire containing 52 questions in total. The questionnaire was developed and tested in a long process lasting several months. It was finally adapted with the help of LimeSurvey. The questionnaire contains questions about motives of self-employment, client relations, success and satisfaction with self-employment, future prospects of the solo-self-employed, and socio-economic characteristics.

A total of 9,002 one-person-enterprises were contacted by the Carinthian Chamber of Commerce in February 2014 and invited to participate in the online survey. The response rate of 7.0 % resulted in a sample size of 626 one-person-enterprises, which is representative with respect to the legal form (over 90 % individual entrepreneurs), age (mean age in the sample and in the total population: 47 years), and gender, with males being slightly overrepresented in the sample compared with the total population. Several findings of the study are published in more details elsewhere (Bögenhold and Klinglmair, 2016a; 2016b; 2016c; 2015a; 2015b; 2014; Klinglmair and Bögenhold, 2014).

The complex interaction of technological development, globalisation and socio-demo-graphic change has accelerated a structural change in the economy, resulting in a changing working environment and new forms of employment. Concerning the field of self-employment, in many countries an emerging trend can be observed towards one-person enterprises, which – for example – already represent more than 50 % of all Austrian companies as described above. One clearly has to keep in mind that these microenterprises are by far not homogeneous in a variety of aspects like motives for self-employment (Bögenhold and Klinglmair, 2015) or by gender on the one hand, and by the extent of additional economic activities (Bögenhold and Klinglmair, 2016a; 2016b; 2016c) on the other hand. For instance, Bögenhold and Klinglmair (2015) found evidence that one-person entrepreneurs are mainly driven by motives like self-realization or working without hierarchies. However, there is also a large group self-employed (25.2 %) that has been crowded out from the (dependent) labour market. These one-person entrepreneurs decided to start their business due to labour market reasons and are therefore driven by economic reasons; thus, self-employment primarily represents an alternative to unemployment. Moreover, this economically driven group of one-person enterprises is comparatively dissatisfied with their professional situation, is less optimistic regarding their entrepreneurial future and generates lower incomes (Bögenhold and Klinglmair, 2015a: 107). Blurred boundaries between dependent work and self-employment exist. These boundaries are fluent and dynamic in their nature and they do not fit with ideas of a clean division, which separates the sphere of dependent work strictly from that of independent work. These overlapping phenomena, when people combine both categories and dependent workers as well as independent actors have overlapping identities (Bögenhold and Klinglmair, 2016a; 2016b; 2016c), are very often neglected in research and are addressed in this paper.

In the collected (and described) data sample – beside 398 one-person enterprises (63.6 %) that are solely self-employed and that perform no additional activities – also 18.5 % (or 116 one-person enterprises) that have an additional dependent employment beside their business have been identified; this group can be described as a ‘hybrid’ form of entrepreneurs. Bögenhold and Klinglmair (2016a) investigated whether this additional

dependent employment represents a necessity-driven secondary job to survive economically, or whether the one-person enterprise, namely the self-employed activity, represents only a secondary source of income. Based on five indicators (e.g. the volume or the monthly net income from dependent employment; for details see Bögenhold and Klinglmair, 2016a: 133) they identified that more than half of the hybrid one-person enterprises (53.3 %) only operates as a sideline business; self-employment activity indeed represents only a secondary source of income (Bögenhold and Klinglmair, 2016a: 136). Additionally, Bögenhold and Klinglmair (2016c) showed that hybrid self-employment significantly differs from non-hybrid 'regular' entrepreneurs with respect to socio-demographic characteristics as well as professional and company-specific factors. For example, the group of regular entrepreneurs primarily works at an own office compared to hybrid forms of entrepreneurship, which are operated as a sideline business mainly at home; in addition, hybrid entrepreneurs significantly focus more often on regional customers and markets. Furthermore, hybrid entrepreneurs are significantly younger (43.6 vs. 48.0 years on average), their businesses exist for shorter periods than regular one-person enterprises (6.9 vs. 9.5 years on average) and they have a lower yearly turnover respectively lower monthly income from self-employment due to the fact that they spend less working time on their business and conversely earn more from the – primarily full-time – dependent employment; for more details see Bögenhold and Klinglmair (2016c: 8-10).

Using a logistic regression model, Bögenhold and Klinglmair (2016b) additionally investigated several factors that determine the probability for the occurrence of hybrid entrepreneurship. Beside age, the situation in which the one-person enterprise was founded, the duration of the enterprise as well as the motives for being self-employed, two important determinants were identified. First, the family background does not play a significant role for explaining hybrid self-employment. The existence of a working partner did not show up to be a statistically significant influencing factor. This result may be caused by the fact that the additional dependent employment is in most cases not necessity-driven (Bögenhold and Klinglmair, 2016b: 15). Second, one-person enterprises where the person has a tertiary education are more likely to be additionally (dependent) employed compared to their less educated counterparts. This result may also be motivated by the preferable situation of academics on the (regular) labour market. In figures, one-person enterprises with a tertiary education are – ceteris paribus – about twice as likely to be employed alongside their business activities than less educated hybrid entrepreneurs (Bögenhold and Klinglmair, 2016b: 16).

This can, on the other hand, also be reflected by the fact that hybrid one-person enterprises are significantly better educated in the collected data sample, as more than one-third (36.2 %, 42 persons) has completed a tertiary education, while this applies to only 24.7 % (126 persons) of non-hybrid entrepreneurs. Conversely, the share of solo-entrepreneurs with an educational level below high school is significantly lower within the group of the hybrid self-employed (38.8 % or 45 persons vs. 49.6 % or 253 persons).¹² In summary, it has been analysed in detail so far, that (1) a large proportion of one-person enterprises in Carinthia are forms of hybrid entrepreneurs that operate their business as sideline business and (2) that these hybrid forms differ enormously from regular entrepreneurs that represent their self-employment as main business. What remains open is whether hybrid entrepreneurs can be

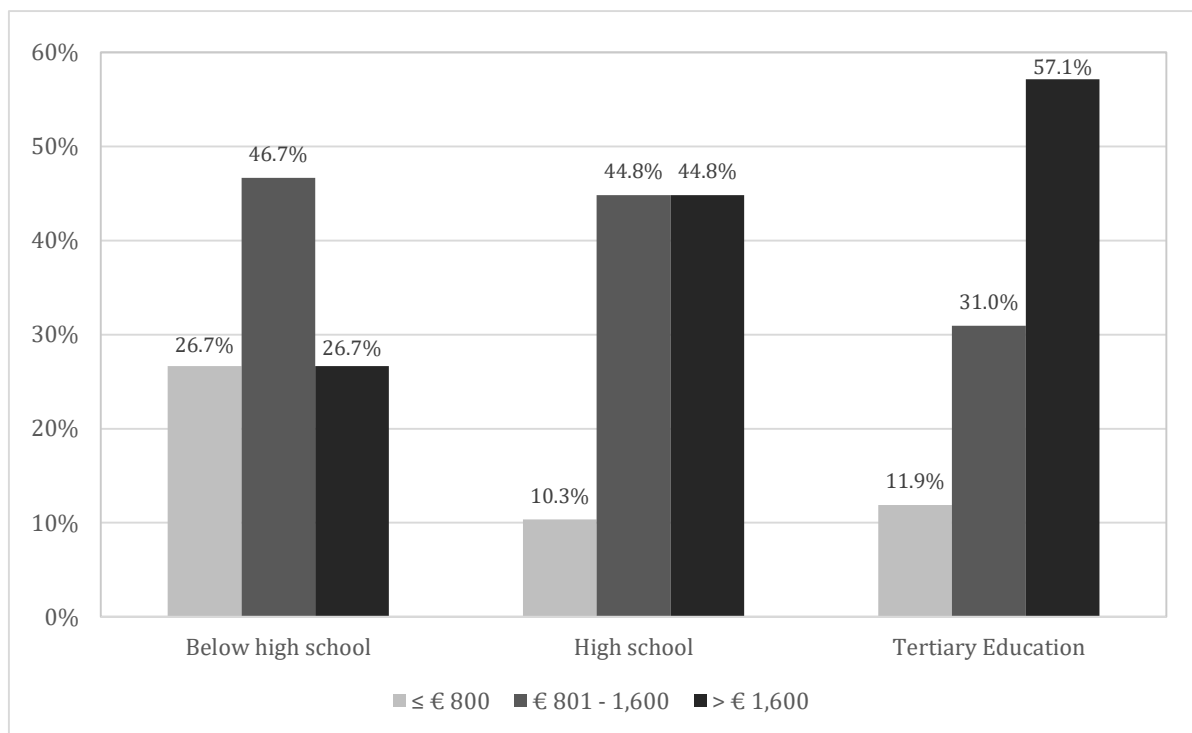
¹² The share of persons with a high school degree amounts to 25.0 % (29 persons) among hybrid entrepreneurs respectively 25.7 % (131 persons) for non-hybrid self-employed.

treated as a homogenous group or if they also differ by selected characteristics, where we especially focus on the educational level in the sense of 'whether human capital matters?'. Are there differences in the amount of the self-employed and/or dependent sources of incomes by educational level and do more highly educated groups achieve higher individual returns on education? What about the satisfaction with the professional career and can the hybrid solo-self-employed be divided into two groups, namely opportunity- and necessity-driven entrepreneurs based on their human capital? These and more questions will be addressed in the following empirical analysis of our data sample in more detail.

With respect to the **monthly net income from additional dependent employment** it can be shown that more highly educated hybrid entrepreneurs (tertiary education level) receive 'returns to education' on the dependent labour market as expected by the human capital theory: the higher the educational level, the higher the dependent income (see Figure 2); this effect is statistically significant based on a contingency table analysis (*Pearson- $\chi^2=10.15$; $p=0.038$*).¹³ In detail, a share of 57.1 % of hybrid entrepreneurs with tertiary education has a monthly net income above € 1,600; in contrast, only about one-eighth (11.9 %) realizes a dependent net income below € 800. For solo-self-employed persons with educational levels below high school vice versa results can be obtained: a share of only 26.7 % ranges in the highest income category, while more than one fourth earns less than € 800 per month; the majority (46.7 %) earns between € 800 and € 1,600 monthly. A similar relationship is observed for medium qualified solo-self-employed (with high school degree): a share of only 10.3 % realizes a monthly net income below € 800; the remaining 89.7 % are allocated equally to the two higher income categories.

Figure 2: Monthly net income from additional dependent employment

¹³ This result is independent from weekly working hours based on a contingency table analysis; there are no statistically significant differences in working hours by educational level (*Pearson- $\chi^2=6.83$; $p=0.337$*), higher income levels **do therefore not** result from higher weekly working hours.



Source: Own Calculations

Before the analysis is expanded additionally also on the relationship between **monthly net-income from self-employment** and the acquired human capital, two facts concerning the general low income levels from hybrid solo-self-employed – compared to non-hybrid entrepreneurs (€ 608 monthly net income on average vs. € 1,347 for non-hybrid entrepreneurs) – should be emphasized: *First*, hybrid entrepreneurs mainly operate their business as sideline business, as already elaborated by Bögenhold and Klingmair (2016a: 136); self-employment activity therefore often only represents an additional source of income. *Second*, the professional fields in which the respondents operate their business – primarily – do not represent the vocational background of the particular entrepreneur as a Kruskal-Wallis-Test, an extension of the Mann-Whitney-U-Test for more two groups, shows ($\chi^2(2)=8.89$; $p=0.012$). Learned skills based on the formal educational background and/or professional experience respectively tenure from dependent employment cannot – one-on-one – be assigned to self-employment activities.

Moreover, a similar effect between self-employment salaries and the educational level – as has been identified for dependent income– cannot directly be observed. For this purpose, the monthly net income was aggregated to two categories; income category 1 with salaries below € 1,000 per month and category 2 with income levels above € 1,000. While hybrid entrepreneurs with a high school degree are allocated between the two categories as expected, it can be shown that higher qualified hybrid entrepreneurs (tertiary education) are slightly overrepresented in category 2 compared to those solo-self-employed with an educational achievement below high school. However, these differences are too small and statistically insignificant; the income from self-employment is therefore independent from the educational level in the collected data sample based on a contingency table analysis ($Pearson-\chi^2=3.46$; $p=0.177$). Nevertheless, what immediately stands out is that – although no significant education-dependent differences in salaries can be identified – **weekly working hours** differ by educational background on a 10%-significance-level ($Pearson-\chi^2=20.83$;

$p=0.053$). While entrepreneurs with tertiary education are overrepresented in categories with low(er) working hours (less than 30 hours/weekly), this group is underrepresented in the category with more than 60 hours per week. These findings are vice versa for hybrid entrepreneurs with an education level below high school; for instance, this group is overrepresented in the category with 60 hours and above. Hence, if we consider self-employment income per hour (instead of monthly salary) the relationship between income and educational achievement can – at least – be observed indirectly for self-employment sources of income as well.

Furthermore, concerning the **branch structure** of one-person enterprises Bögenhold and Klinglmair (2016c: 851) already elaborated that differences with respect to business sectors between hybrid and non-hybrid solo-self-employed are statistically not significant. Conversely, if we consider only hybrid solo-self-employed and differentiate the business sectors where the hybrid entrepreneurs operate by educational status, significant results – based on a contingency table analysis – arise: tertiary educated solo-self-employed (as well as the group of hybrids with a high school degree) operate to a significant higher amount in prosperous branches like the industry sector or the information and consulting (ICT) branch, while the opposite is true for persons with educational levels below high school. The group of lowest qualified solo-self-employed perform their business to a comparatively higher extent in the trade sector or in the tourism branch and are – conversely – underrepresented in the industry sector respectively the ICT branch ($Pearson-\chi^2=26.06$; $p=0.011$).

Focusing further on the **regional distribution** of enterprises the data show that medium and high qualified solo-self-employed operate their business primarily in the Carinthian central area (Klagenfurt-Villach), while entrepreneurs with an educational achievement below high school perform their business to a higher extent in Carinthia's rural regions; these differences are significant on a 10%-significance level based on a contingency table analysis ($Pearson-\chi^2=28.21$; $p=0.059$). Additionally, significant differences concerning the **main workplace** – again on a 10%-significance-level – arise by qualification status ($Pearson-\chi^2=13.99$; $p=0.082$). While, for example, 82.2 % of solo-self-employed firms without high school degree operate their business at home ('home office') or directly at the customers' premises, this is true for a comparatively lower share of 69.0 % for tertiary educated hybrid entrepreneurs. In contrast, the lowest qualified group is underrepresented in the category 'own office' or 'co-working-spaces' (13.3 % low vs. 23.8 % high qualified solo-self-employed). For the lowest qualified solo-firms with significant lower dependent income levels and lower entrepreneurial salaries, operating an own office or co-working-space seems to be unprofitable. Combined with the fact that this group performs their business in rural regions, long(er) distances directly to the customers and thus (transport) costs arise for this already disadvantaged group. Nonetheless, the identified lower (dependent as well as self-employed) incomes and the higher amount of weekly working hours for low qualified compared to medium and higher qualified solo-self-entrepreneurs have no significant influence either on **job satisfaction** or on the **satisfaction with the 'work-life-balance'** based on two separate Kruskal-Wallis-Tests ($\chi^2(2)=0.15$; $p=0.928$ for job satisfaction and $\chi^2(2)=1.02$; $p=0.600$ for satisfaction with the work-life-balance).

With respect to the empirical findings above it can be concluded that there are two major groups within the examined hybrid solo-self-employed. On the one hand, we have those (highly qualified) actors who pursue an additional job because they see an opportunity to maximize their income, on the other hand there are actors who have to pursue an additional

job to compensate for the lower income they receive from their dependent employment relationship ('necessity driven'). In other words, we can summarize that we find opportunity-entrepreneurs as well as necessity-entrepreneurs within the specific group of hybrid solo-firms. Although the hybrid solo-self-employed belong to either the first or the latter category, no difference with respect to their job satisfaction can be found. This reflects that fact that necessity-entrepreneurs know, at the end of the day, that they have to engage in an additional profession – beside their low paid dependent employment – to make ends meet, but they accept these circumstances. Similar studies (and results) on the educational background differentiating between opportunity-based and necessity-based self-employed have already been conducted (e.g. Baptista et al., 2013), but there is much space for further research, in particular with a focus on the hybrid solo-self-employed.

5. Conclusions and Outlook

As the 'rules of the game' (Baumol, 1990) are changing, we have to pay attention to the changing character of self-employment. Different countries have different specific institutional *settings*, making it almost impossible to generalize self-employment. Contextual views are necessary to grasp the diversity in self-employment, therefore an acknowledgment of the historical, temporal, institutional and social context is inalienable (Welter, 2011). The implication is that we have to respect different forms of self-employment when talking abstractly about the category of self-employment in the labour market, too diverse are the social, economic and cultural conditions and related biographies. Among the heterogeneity of actors under the umbrella of self-employment the empirical focus of the paper concentrated on the *one-(wo)men firms*, which are in other words self-employed people without further employees. Here, more specifically, we asked about those one-person-self-employed who have further sources of income as dependent labourers. This group is – most commonly – called *hybrid self-employment*.

Hybrid self-employed actors are difficult to locate exactly between the boundaries of the employee and the self-employed. Two forms of hybrid self-employed have been classified by Bögenhold and Klinglmair (2016c): (1) self-employed having an additional dependent employment relationship to maximize their income and vice versa (2) people having a dependent employment relationship who pursue a form of self-employment to ensure an additional income.

Our findings suggest that analysing the categories of hybrid entrepreneurs shows strong differences according to their human capital. The higher the amount of human capital the higher is – on average – their income, especially income as employees. On the other hand, the lower the level of human capital, the more likely economic actors are just working part-time. Comparing the income of low and high human capital people through self-employment shows first hand that there are no clear differences regarding education, but those with better education work shorter hours, thus they can realize a human capital return. Neither segments differ regarding work satisfaction and intentions to grow.

We have to rethink the often used dichotomous perspective when we look at self-employment. 'Black' and 'white' considerations are not sufficient to capture the richness of actors under the self-employed banner and their specific forms of 'happiness' (Meager, 2015). In a discussion full of synonyms, some of the affected persons do not even know to which

category they belong (McKeown, 2015). Probably one of the most promising tasks in research is the necessity to deliver generalizable theoretical contributions which differ from those established or are even in conflict with them (Di Gregorio, 2004). The great heterogeneity and the very modest amount of 'classic' self-employed persons constitute a difficult challenge for research (Davidsson et al., 2010).

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The relationship between financial distress and well-being: Exploring the role of self-employment

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Abstract

This article investigates the relationship between financial distress, well-being and employment status (wage-employed versus self-employed). The analysis employs two measures of financial distress and four indicators of well-being: physical health, mental health, life satisfaction and quality of life. Using data for wage-employed and self-employed workers aged 50 and over from 21 European countries, results show strong and consistent evidence for a negative association between financial distress and well-being, thereby confirming earlier literature. The novel finding is that this relationship is moderated by employment status in the sense that financial problems are more strongly associated with poor well-being for the self-employed compared to the wage-employed. Hence, when self-employed workers find themselves in a situation of financial distress, the negative consequences for their well-being are more severe. This holds both for the self-employed with and without employees.

Keywords: financial distress, income, self-employment, well-being.

JEL codes: D31, I14, I31

Introduction

Self-employment has often been studied in relation to incomes. While it has been shown that, on average, self-employment pays less than wage-employment (Hamilton, 2000), more recent research shows that this holds particularly for the self-employed without employees as those with employees generally earn more than the wage-employed (Sorgner, Fritsch, and Kritikos, 2017). Findings such as these are highly important in the context of discussions on precarious employment, generally understood to be workers with low incomes, low social security and high job insecurity. Precarious workers are important from a policy perspective as they are at risk of falling into unemployment and inactivity. They also run a higher risk of ill-health (Benach and Muntaner, 2007; Lewchuk et al., 2008; Vosko, 2006).

Although the above suggests that the self-employed (and in particular the solo self-employed) may be more likely to end up in precarious employment, self-employment describes a very heterogeneous group of workers (Bögenhold and Fachinger, 2012; CRSE, 2017), ranging from highly successful and productive freelancers (Burke, 2011) to vulnerable workers being exploited by former employers (Román, Congregado, and Millán, 2011). What is unclear though is how large this group of vulnerable self-employed actually is and, consequently, whether the issue of precariousness is a bigger problem among the wage-employed or self-employed. Moreover, it is also unknown if the consequences of precariousness on well-being differ among the wage-employed and self-employed. For instance, the precarious self-employed may experience a stronger feeling of failure (if their business is not successful) or responsibility towards employees (in case of employer entrepreneurs), compared to the precarious wage-employed, possibly having a more negative impact on their well-being. This article, therefore, investigates the relationship between precariousness, well-being and employment status (wage-employment versus self-employment).

The analysis investigates two primary research questions. First, does the extent of precariousness (in terms of financial distress) differ between wage-workers and self-employed workers, and within the latter group, between solo self-employed and employer entrepreneurs? Second, does the relationship between precariousness and well-being differ for workers with different employment statuses? This article investigates these questions using a dataset of wage-employed and self-employed workers aged 50 and over from 21 European countries. The dataset includes several measures of well-being and also various personal and job characteristics. The analysis specifies and estimates a set of models relating the various well-being measures to employment status (self-employed versus wage-employed), financial distress and a wide range of control variables.

Although precariousness also involves aspects such as job insecurity and limited social benefits (Vosko, 2006), in the present article, the focus is on the income aspect, arguably one of the strongest impacts on an individual's well-being (Leana and Meuris, 2015). However, current income is only part of a person's financial health, as accumulated savings may be equally, if not more, important (Aittomäki et al., 2010; Mwaura and Carter, 2015). The impact of a low income on a person's well-being is likely to be stronger if there are no alternative resources available to pay the bills, rather than being able to draw on a savings account. Savings, and hence financial health, varies greatly across individuals, and especially across self-employed individuals (Fachinger and Frankus, 2017). This analysis utilizes a broader measure of financial health than income that considers a person's complete financial

situation, an approach that is consistent with the OECD's analysis of both income and wealth on well-being (OECD, 2013). In particular, respondents in the survey used in this analysis are asked if they have money worries and if they have debts (apart from mortgage). These are labelled as indicators of financial distress (i.e. poor financial health). They capture the notion that (financial) precariousness concerns more than just current income, and that it deals with the lower tail of the financial health distribution. The use of both of these measures also allows us to provide both a subjective (Money Worries) and an objective (Debt) measure of financial distress, as suggested by Binder (2018).

The analysis contributes to the extant literature in several ways. First, this is the first article to investigate the relationship between self-employment and well-being in a multi-country setting, including not only highly developed countries but also countries recently coming out of transition (e.g. some East European countries). Earlier articles focus on databases from single, highly developed countries (Rietveld et al., 2015 on the US; Hessels et al., 2017 on Australia). Second, four measures of well-being are used; physical health, mental health, life satisfaction and quality of life, in order to provide a more holistic analysis of well-being (Binder, 2018). Third, there is a specific focus on the interaction between financial health and employment status in explaining well-being, while using a broader (and hence, more appropriate) measure of financial health than the usual measure of current income. This broader measure is particularly appropriate for the sample of 50 plus population considered in our database, as these individuals have had time to accumulate savings to compensate for low income. This is especially relevant for self-employed individuals in their fifties as they are typically not covered by statutory pension systems and hence rely on private savings for maintaining their living standard after retirement (Fachinger and Frankus, 2017). Fourth, a broad range of control variables are used, including measures of job control and job demand which recently have been found to be vital for explaining work-related stress (Hessels et al., 2017).

This article is organized as follows, the first section provides a literature review on the relationship between self-employment, financial health and well-being. Data, methods and results are then presented. Finally, conclusions from the analysis are outlined and discussed.

Literature Review and Hypothesis Development

The increasing prevalence of flexible working arrangements and the associated job insecurity has been viewed as a potential risk to health (Benach and Muntaner, 2007; Vosko, 2006). Several articles have explored the extent to which non-permanent employment can be described as precarious (Doogan, 2005; Fevre, 2007; Louie et al., 2006; Vosko, 2006). These articles categorise non-permanent workers as those on short-term contracts, temporary workers or the self-employed. Borghi, Cavalca and Fellini (2016) document the increase of precariousness among independent professional workers. In this current article, the well-being and financial situation of the self-employed relative to the wage-employed is explored. It is proposed that the (positive) link between self-employment and well-being is mitigated by the financial situation of the self-employed, in particular the solo self-employed (self-employed with no employees).

Self-Employment and Well-Being

The job-demand-control model (Karasek, 1979; Theorell and Karasek, 1996) provides a framework for the effect of self-employment on well-being. It emphasizes two aspects of the work environment: the extent to which workers feel control over their work environment and the demands placed upon them by their employment, contributing to stress levels and to health outcomes (Molarius et al., 2007; Van der Doef and Maes, 1999). Compared to the wage-employed, the self-employed have higher levels of job control but also higher levels of job demand, termed the double-edged sword (Lewin-Epstein and Yucktman-Yaar, 1991). Stephan and Roesler (2010) attribute better health and well-being of the self-employed to higher levels of both job demand and control which result in more active jobs, and positive health consequences. Hessels, Rietveld, and Van der Zwan (2017) find that the self-employed have greater job control and that this fully mediates the relationship with work-related stress (i.e., the self-employed are found to have lower work-related stress levels than wage workers). Rietveld, Van Kippersluis, and Thurik (2015) find that the self-employed are healthier than the wage-employed, which they attribute to two possible effects: the barrier effect, stating that healthier individuals may self-select into self-employment and the contextual effect, stating that self-employment may have a positive impact on health. They conclude that the barrier effect is most likely and that although self-employment is associated with better health, it does not necessarily *cause* better health.

Despite the lower stress levels of the self-employed reported by Hessels et al. (2017), the overall evidence in the literature on the relation between self-employment and stress is actually mixed, with several studies reporting higher rather than lower stress levels for the self-employed (see Hessels et al., 2017, for an overview). This may be because the self-employed work more hours and feel responsible for their business and their employees (Parasuraman et al., 1996). However, when more general measures of well-being are concerned, many studies find a positive relationship between self-employment and subjective well-being (Blanchflower 2004; Benz and Frey 2008; Andersson 2008, Binder and Coad 2013) and job satisfaction (Blanchflower, 2000; Blanchflower and Oswald, 1998; Millán, Hessels, Thurik, and Aguado, 2013). Binder and Coad (2013) examine life satisfaction and self-employment in Britain. They distinguish between opportunity and necessity self-employed, and find that those entering self-employment to pursue an opportunity experience an increase in life satisfaction while those entering self-employment out of necessity do not. Allowing for the heterogeneity of self-employment, Benavides et al. (2000) distinguish between the self-employed with and without employees, and find that the self-employed without employees report high levels of job dissatisfaction, fatigue and muscular pains relative to the wage-employed. Boegenhold and Klinglmair (2015) further differentiate the self-employed with no employees into opportunity and necessity-driven and find that the necessity-driven cohort reports lower job satisfaction than the opportunity-driven cohort. Seva et al. (2016) show that self-employment is positively related to subjective well-being, but the self-employed with employees report a higher level of life satisfaction than the self-employed without employees. On the other hand, Hessels et al. (2017) find that the self-employed with employees have higher levels of stress than those without employees.

Self-Employment and Financial Health

Self-employment has been found to pay less than wage-employment (Hamilton, 2000). However, Hartog, Van Praag, and Van der Sluis (2010) compare the effect of cognitive ability on entrepreneurs' incomes and find that a balanced range of abilities boosts entrepreneurial incomes more than those of wage-earners. In a similar vein, Lofstrom (2013) finds that wage employment is more financially rewarding for lower skilled female workers. Sorgner et al. (2017) distinguish between the self-employed with and without employees and find that those with employees earn more than wage-earners while the solo self-employed earn significantly less, highlighting the need to differentiate between these two categories of self-employed workers. Boegenhold and Klinglmair (2015) find that the solo self-employed driven by necessity report lower incomes than the opportunity-driven solo self-employed.

Using both wealth and income to measure economic well-being, Quadrini (2000) finds that entrepreneurs have a greater wealth to income ratio than the wage-employed. However, this relationship may not necessarily be causal as individuals from wealthier family situations may have less financing constraints leading to higher levels of entrepreneurship. Importantly, Quadrini (2000) also notes that the self-employed have greater income uncertainty and hence a greater incentive to engage in precautionary saving to smooth consumption. This current article argues that greater income uncertainty may increase the likelihood of financial distress. Mwaura and Carter (2015) argue that income is a poor measure of the financial rewards of entrepreneurship, due to under-reporting, mismeasurement and its failure to fully capture the economic well-being of the entrepreneur. They focus instead on the stock of economic resources and find that entrepreneurial households are wealthier. They find that entrepreneurship has a cumulative effect on wealth for households above the median level but not for those below. Hence, for the self-employed below the median (typically solo self-employed), their income is hardly sufficient to increase their wealth. These authors also find that the solo self-employed have lower levels of wealth than the self-employed with employees. Considering all the evidence, the first hypothesis reads as follows.

Hypothesis 1a: *The extent of financial distress is higher among the self-employed than among wage-workers.*

Hypothesis 1b: *The extent of financial distress is higher among the solo self-employed than among the self-employed with employees.*

Financial Health and Well-Being

Preston (1975) states that there is a positive and concave relationship between income and health and this is further supported by studies by Adeline and Delattre (2016), Carrieri and Jones (2017), Ettner (1996) and Mackenbach et al. (2004). Stronks, van de Mheen, van den Bos, and Mackenbach (1997) find that although the positive association may be in part due to employment status, income has a stronger association with health than either education or occupation. Molarius et al. (2007) report that lower levels of self-reported health in Sweden could be determined partly by economic hardship while Muennig et al. (2008) examine the causality between income and health, and conclude that income affects health more than health affects income. Further studies investigate the effect of income on social well-being (Diener and Seligman, 2004; Easterlin, 1995; Ferrer-i-Carbonell, 2005) and find that the relationship is generally positive but diminishing. Similarly, Lamu and Olsen (2016) find

that the relative importance of income for subjective well-being is more important at the lower end of the distribution.

Meer, Miller and Rosen (2003) and Smith (1999) explore the relationship between wealth and health and find a positive effect of wealth on self-reported health, while Aittomäki et al. (2010) argue that current income is an insufficient measure of economic welfare, and find a strong association between wealth and health. Adams, Hurd, McFadden, Merrill, and Ribeiro (2003) suggest that the relationship between wealth and health may also be affected by the depletion of economic resources due to poor health. In addition, high levels of debt can negatively affect health. O'Neill, Sorhaindo, Xiao, and Garman (2005) examine the relationship between consumer debt and health in the US and find a positive relationship between better financial health and physical health. Selenko and Batinic (2011) find that the effects of debt on the individual are not limited to just financial distress, but can also lead to physical and psychological distress. Holders of non-mortgage debt in the UK were found to be associated with poorer mental health (Brown, Taylor, and Wheatley Price, 2005). Annink et al. (2016) find a strong negative relationship between financial hardship, measured by the individual's feeling about their income and access to borrowing, and subjective well-being. They find that this relationship is mitigated by levels of education and social welfare support.

Financial Health and Well-Being: The Role of Self-Employment

Psychology research suggests several factors that are strongly associated with positive well-being; health, income and relative income, employment, and social and family relationships (Dolan, Peasgood, and White, 2008). The relationship between financial health and well-being may differ for the self-employed and the wage-employed. This article argues that a threat to an individual's financial status can have a greater impact on health and well-being for the self-employed, due to the greater possible consequences that a situation of financial distress may have. In particular, in case of debts or other money worries, many self-employed are immediately at risk of losing their business and source of income. In addition, they are at risk of losing their house or other property as many self-employed use collateral to finance their business (Schmaltz et al., 2017). In contrast, for the wage-employed in financial distress, the long-term consequences are often much smaller and a setback in their financial situation may have only temporary consequences. Besides the risk of losing their business, emotional attachment to their job (i.e. their business) is also often much stronger for the self-employed compared to the wage-employed (Shepherd, 2003). Hence, since the negative consequences of financial distress may be more acute and longer-lasting in nature for the self-employed compared to the wage-employed, their well-being may be much stronger affected. The effect may be greater still for the self-employed with employees, as their businesses are typically bigger than those of solo self-employed, and hence, the financial risks in a situation of financial distress are also greater.

A further impact can be that the self-employed feel more responsible for the outcome of their work than the wage-employed and hence, they will feel greater shame when financial problems occur (Smith and McElwee, 2011). Shepherd (2003) finds that business failure can result in emotional responses similar to grief. Their financial difficulties may therefore have an exacerbated effect on their well-being than would be the case for wage-workers who may

have lost their job through no fault of their own. Moreover, Srivastava, Locke, and Bartol (2001) find a negative relationship between the importance of money and subjective well-being. They argue that money is of itself not driving the relationship, but rather the motives behind wanting it, such as social positioning, a feeling of power, pride, status and overcoming self-doubt. They find that the more importance people placed on money the poorer was their subjective well-being. These motives may be stronger for the self-employed, especially those who see entrepreneurship as a challenge (typically the self-employed with employees). This leads us to the hypotheses associated with our second research question.

Hypothesis 2a: The (negative) relationship between financial distress and well-being is more pronounced for the self-employed than for the wage-employed.

Hypothesis 2b: The (negative) relationship between financial distress and well-being is more pronounced for the self-employed with employees than for the solo self-employed.

Data and Sample

The analysis uses data from the Survey of Health, Ageing and Retirement in Europe (SHARE), (Boersch-Supan et al., 2013; Boersch-Supan, 2017). The SHARE project conducted interviews with 123,000 individuals aged 50 or older and their spouses (over 297,000 interviews) across 20 European countries and Israel, in 6 waves in 2005, 2007, 2009, 2011, 2013 and 2015, collecting data on health, employment, socio-economic status, social networks and other demographic factors. In total 21 countries participated in the survey but not all countries participated in all waves.¹ A similar dataset exists in the US – the Health and Retirement Study, and in the UK – the English Longitudinal Study of Ageing, but the SHARE database is unique as a cross-country study. The dataset allows us to differentiate between those in employment and self-employment, and within self-employment between those with and without employees. Our sample of relatively older individuals (50+) is advantageous for our research purposes for two reasons. Firstly, health issues usually become more prevalent by this age, and secondly, financial health may be more comparable among individuals who have had time to establish a successful career or business, and time to accumulate savings. The SHARE database has been used to study the impact of employment on standards of living (Achdut and Biton, 2008), job satisfaction of the wage-employed and self-employed by disability status (Pagán-Rodríguez, 2011), income-related health inequalities (Adeline and Delattre, 2016) and the impact of employment and retirement on health (Buffel, Missinne, and Bracke, 2017; Kouwenhoven-Pasmooij, Burdorf, Roos-Hesselink, Hunink, and Robroek, 2016; Reeuwijk, van Klaveren, van Rijn, Burdorf, and Robroek, 2017; Segel-Karpas, 2015).

Data from Waves 2, 4, 5 and 6 are included. Many key variables are missing in Wave 1 and Wave 3 is excluded as it focuses on respondents' life histories, with different survey questions than the other five waves. Only those aged 65 or under are included in order to capture the working age population, as the normal retirement age in the countries surveyed is 65. Those identified as currently employed or self-employed are included, and those categorised as retired, sick, unemployed or homemaker are excluded. Restricting the dataset by these criteria reduces the sample size to between roughly 40,000 to 55,000 per variable as shown in Table 2. These restrictions, by their nature, render the dataset cross-sectional in nature. The final sample sizes for our regression models are approximately 22,000 for Poor Health, Life Satisfaction and Quality of Life, and about 18,000 for Depression.

Model variables

For our dependent variables, four measures of well-being are used: physical health, mental health, life satisfaction and quality of life. For physical health, the variable *Poor Health* is used, which measures if the respondent has been diagnosed with any one of a list of serious health conditions (listed in Table 1). *Depression* is used as our measure of poor mental health. For these measures a higher value indicates poorer physical or mental health. For our other two measures of well-being *Life Satisfaction* and *Quality of Life* a higher value corresponds to better well-being (see Table 1 for the exact variable definitions). These four measures encompass both objective (Poor Health) and subjective (Depression, Life Satisfaction and Quality of Life) perspectives of well-being (Binder, 2018; Erdogan et al., 2012; Van Praag et al., 2003). Binder (2018) emphasises the importance of also analysing subjective well-being for a more holistic view. Therefore, both subjective and objective measures of well-being are used in this analysis.

The main independent variables measure a respondent's employment status and financial health. Respondents are categorised as public sector employees or private sector employees (wage-employed) or self-employed in their current job. Those in self-employment are subdivided into those with and without employees. Two measures of financial distress are included. Although the survey includes questions about current and past income, the broader measures of financial health are selected to jointly capture income and wealth effects, as income is often a poor indicator of total wealth. For the first measure, *Money Worries*, respondents are asked how often a shortage of money stops them from doing the things they want to do. For the second measure, *Debt*, respondents are asked if they owe money apart from on mortgages or money owed on land, property or firms. Stephan (2018) notes that it is often the subjective perceived sense of financial distress (typically related to perceived business failing) rather than the objective financial conditions that negatively affect the well-being of the self-employed. Therefore, a subjective measure (*Money Worries*) and an objective measure (*Debt*) is used to provide a more complete picture of financial distress.

TABLE 1 here

Characteristics of the respondent's employment, *Job Demand* and *Job Control*, are also included. *Job Demand* is measured as the response to a question whether a respondent's job is physically demanding or if they feel under constant time pressure due to a heavy workload. (*Lack of*) *Job Control* measures a respondent's sense of control over their job, measured by their response to the statement 'I have very little freedom to decide how to do my work'. The analysis also includes *Log Hours Worked*, the logarithm of the number of hours worked in a usual working week and a set of industry dummies. Finally, a broad range of demographic control variables are included, which may impact our measures of well-being: *Gender*, *Age*, *Age Squared*, *Years of Education*, *Marital Status*, *Number of Children*, *Mother Alive* and *Father Alive*. The code and text for each question in the SHARE questionnaire is listed in Table 1.

Descriptive statistics

Descriptive statistics of our sample are presented in Table 2. For each of our dependent and independent variables, the mean and standard deviation is listed for four categories of employment: wage-employed and self-employed and within self-employment those with and without employees. T-tests were performed to check for mean differences between the *Wage-Employed* and the *Self-Employed* and between the *Self-Employed with Employees* and the *Solo Self-Employed*. When comparing wage-employed to self-employed, the mean values for the self-employed are significantly lower for Poor Health and Depression and significantly higher for Life Satisfaction and Quality of Life, indicating that the self-employed are healthier and happier than the wage-employed. Similarly, the self-employed with employees are found to be healthier and happier than those without employees. Regarding the variable Poor Health, the order of magnitude (between 55-60% of workers older than 50 years reporting at least one health condition) is in the same order of magnitude as found for a similar variable employed for the United States (Rietveld et al., 2015).

TABLE 2 here

For the group of self-employed as a whole, *Money Worries* are slightly higher relative to the wage-employed (48.7% versus 48.3%), but when distinguishing between self-employed with and without employees, it is clear that the solo self-employed significantly more often report to (often or sometimes) have money worries (57.2%), compared to self-employed with employees (44.3%) or wage-employed (48.3%).

Among the total group of self-employed, the share of individuals with debts is significantly lower than among the group of wage-employed, although the difference is only 1.4 percent point (52.3% versus 53.7%). The share of individuals with debts is higher for solo self-employed compared to self-employed with employees but the difference is not significant. Regarding Hypothesis 1a, *Money Worries* are slightly higher among the self-employed, but only with a small margin, and only at a significance level of 10%. *Debt* has a lower mean for the self-employed. Overall, these statistics suggest that H1a is not supported.

Regarding Hypothesis 1b, results show a higher share of individuals with *Money Worries* among the solo self-employed compared to the self-employed with employees, while the share of individuals with debts is also slightly higher among the solo self-employed (although not significantly). Therefore, results support H1b, suggesting that the solo self-employed are the least financially sound. These results highlight the importance of distinguishing between self-employed workers with and without employees.

The average score for *Job Demand* is higher for the self-employed, but particularly for those with employees, indicating high work pressure, while workers in wage-employment have the highest score for (*Lack of*) *Job Control*, indicating the least freedom. The solo self-employed have the greatest freedom over how to do their job. The self-employed work longer hours than the wage-employed, the most by those with employees.

The self-employed with employees have the largest proportion of males and are the oldest on average. The wage-employed have spent most years in education, while the solo self-employed are on average the youngest, the least educated, have the least number of children, and are least likely to be married than the other categories.

Table 3 presents the descriptive statistics of our data sample by country. It reports the means and standard deviation for *Money Worries* and *Debt* for three categories of employment: the wage-employed, self-employed with employees and the solo self-employed. The mean value of *Money Worries* is lower for the self-employed with employees than for the wage employed for almost every country. For the solo self-employed, the mean value for *Money Worries* is higher than the mean values of the other two categories of employment for all but four countries. This suggests that the solo self-employed are in the most precarious financial position, and is consistent with the findings of Sorgner et al. (2017) that the solo self-employed are less well off than the wage-employed and the self-employed with employees. The mean values for *Debt* are highest for the solo self-employed for 13 of the 21 countries, but otherwise the results are mixed. When comparing countries, the solo self-employed have the most *Money Worries* in Greece, Portugal and former Eastern European countries, Poland, Estonia and Hungary, while the solo self-employed are most likely to have debt in Israel, followed by Croatia and Portugal. Workers in Switzerland, Denmark, the Netherlands and Sweden have the least debt and money worries across all categories of employment.

TABLE 3 here

Methods and Results

Methods

For each of the four dependent variables measuring different aspects of well-being (see Tables 4-7), four regression models are presented. Model (1) is the basic model variant, which focuses on the impact of self-employment (versus wage-employment), money worries and debt. Model (2) then introduces interaction terms between self-employment and the two measures of financial distress. In particular, the interaction terms *Self Employed x Money Worries* and *Self Employed x Debt* are included, allowing us to establish whether the relationship between financial distress and the well-being measures differs between self-employed and wage-employed workers (see Hypothesis 2a). Model (3) then distinguishes between self-employed with and without employees while Model (4) does the same but also includes interaction terms between the two types of self-employment and the two measures of financial distress: *With Employees x Money Worries*, *With Employees x Debt*, *Solo x Money Worries* and *Solo x Debt*. This model allows us to test Hypothesis 2b. Control variables as well as sets of country and industry dummies are included in each regression, and standard errors are clustered at the country level.

The analysis estimates a pooled binary logit regressions for the dependent variables *Poor Health* and *Depression*, and ordered logit regressions for *Life Satisfaction* and *Quality Of Life*, as these latter variables can take on values other than 1 or 0, while obeying a logical ordering. For the pooled logit regressions, the regression coefficients (and the associated standard

errors) are reported, for the ordered logit models the marginal effects and standard errors are reported. For *Life Satisfaction* and *Quality Of Life* the marginal effects are calculated relative to the highest possible score for each measure (10 for *Life Satisfaction* and 4 for *Quality of Life*). For the first two models, a positive coefficient indicates a negative relationship with physical or mental health. For the final two models, a positive marginal effect indicates a positive relationship with Life Satisfaction or Quality of Life. The results are presented in Tables 4 to 7.

Results

In Table 4, the results for Poor Health are reported. Relative to wage-workers, being self-employed has a negative and significant relationship with this measure, indicating that the self-employed are less likely to report poor health (Model 1). When a distinction is made between the self-employed with and without employees, the solo self-employed are, *ceteris paribus*, less likely to have poor health, compared to wage-workers (Model 3). The coefficient for *Job Demand* is positive and significant, indicating a negative relationship with physical health. The coefficient for *Log Hours Worked* is negative and significant, indicating that those working longer hours are in better health. Although a significant relationship is found, the causation would likely run in the opposite direction; those in good health will tend to work longer hours, or at least have the capacity to do so. *Money Worries* and *Debt* have a strongly significant and positive relationship with Poor Health, as expected. Looking at the interaction terms, being self-employed with money worries is associated with worse physical health (Model 2), and this holds in particular for the solo self-employed (Model 4). Thus, money worries are negatively related to physical health for all employment statuses, but this negative relation is even stronger for the solo self-employed, i.e. this group of workers seems to suffer even more from money worries, in terms of the probability of having poor health.

TABLE 4 here

Regarding the control variables, *Gender* has no significant relationship with Poor Health. The coefficient for *Age* is positive and significant, as expected, as health worsens with age. *Education* has a negative, significant coefficient, implying that more years in education is related to better health. Regarding marital status, results show poorer health for widowed individuals than for those who are married. Having children is not significant in three of the four models while having parents alive is positively associated with physical health, especially when the mother is still alive.

Table 5 reports the results for our measure of mental health, *Depression*. Employment status is insignificant. *Job Demand* and *(Lack of) Job Control* have a strongly significant positive relationship, indicating worse mental health. *Log Hours Worked* is associated with better mental health. *Money Worries* and *Debt* are also strongly positively associated with depression, as expected. Regarding the interaction terms, only the term *With Employees x Money Worries* has a significant positive relationship, suggesting that money worries have a greater negative impact on mental health for the self-employed with employees compared to the wage-employed.

Interestingly, *Gender* is significant for mental health, where male respondents are less likely to report having been depressed. Increasing age is associated with more depression, but at

a decreasing rate (note that the squared term is significantly negative). Marital status has a stronger relationship with mental health than with physical health, where being divorced, never married or widowed is strongly associated with more depression (compared to being married). Respondents with a mother alive report less depression.

TABLE 5 here

Tables 6 and 7 report the results for *Life Satisfaction* and *Quality of Life*. Relative to wage workers, the self-employed are more likely to report the highest score for *Quality of Life*, as are the self-employed with employees (Models 1 and 3, respectively). Both *Job Demand* and *Job Control* reduce the likelihood of a respondent reporting the highest score for *Life Satisfaction* or *Quality of Life*, while hours worked increases the probability of both. Reporting *Money Worries* decreases the likelihood of reporting the highest score in each measure. For Debt there is only such a negative relationship with *Quality of Life* though. Regarding the interaction terms the joint impact of debt and self-employed and the joint impact of debt and solo self-employed decreases the probability of reporting the highest score for *Life Satisfaction* (see Table 6, Models 2 and 4, respectively). The self-employed with money worries, and particularly those with employees, are less likely to report the highest score for *Quality Of Life*, compared to other types of workers who also have money worries (see the interaction terms in Table 7, Models 2 and 4).

Gender and having parents alive does not significantly affect either measure, while *Age* is negatively associated with *Life Satisfaction*. *Education* increases the likelihood of a high score for both measures, as does having children. Relative to married individuals, respondents who are divorced, never married or widowed are less likely to report the highest score for each measure.

TABLE 6 and 7 here

Overview of Main Results

An overview of the main regression results (i.e. those related to Hypotheses 2a and 2b) for the four measures of well-being is presented in Table 8. For each measure, the table indicates whether the employment status variables, the financial health variables and interaction terms are significant at the 10% level and if so whether the coefficient is positive or negative. Again, for Poor Health and Depression variables a positive sign indicates worse physical or mental health whereas for Life Satisfaction and Quality of Life variables a positive sign indicates greater well-being.

TABLE 8 here

In summary, the self-employed and in particular the solo self-employed are found to have better physical health than the wage-employed. For mental health, there is little difference by employment type. For Life Satisfaction and Quality of Life, the self-employed and the self-employed with employees are happier than the wage-employed, but there is no significant difference between the solo self-employed and the wage-employed (the reference category). Having money worries is bad for physical health, mental health, life satisfaction and quality of life while having debts is bad for three out of these four well-being measures, life satisfaction being the exception.

Regarding the interaction terms, being self-employed with money worries has a positive association with Poor Health, in particular for the solo self-employed. Moreover, having money worries and being self-employed with employees has a negative association with Mental Health. Having debt or money worries while being self-employed is associated with lower levels of Life Satisfaction and Quality of Life, while being solo self-employed with debt and having money worries with employees reduce the incidence of high scores for these variables. On balance, findings support Hypothesis 2a, the negative impact of financial distress on well-being² is exacerbated for the self-employed relative to the wage-employed.³ Hypothesis 2b is supported by the findings for Mental Health and Quality of Life (in the sense that the interaction term for 'With Employees' is significant in the expected direction, and the interaction term for 'Solo' is not significant)⁴ but not for Physical Health or Life Satisfaction. Overall, results suggest that Hypothesis 2b is not supported.

Finally, Tables 4-7 also show that a job that is demanding or over which a worker feels they have little control has a negative association with almost all of the dependent variables, while hours worked has a positive association. Age is generally negatively associated with all measures of well-being, but at a decreasing rate, while being married, having children, having more years of education and having parents alive are positively associated with well-being, where significant. Gender is only significant for Mental Health, with men reporting better mental health.

Conclusions

Income is a crucial driver of well-being (Stronks et al, 1997). However, especially for relatively older labor force participants, current income is only part of a person's financial health, as accumulated savings may vary greatly across individuals. This article uses broader measures of personal financial health and relates them to four indicators of well-being: physical health, mental health, life satisfaction and quality of life. In the context of self-employment versus wage-employment, the following two research questions are investigated. First, is the extent of precariousness (in terms of financial distress) higher among wage-workers or self-employed workers, and between the self-employed with and without employees? Here results show that a considerably higher percentage of solo self-employed workers have money worries compared to the wage employed and employer entrepreneurs, similar to findings by Boegenhold and Klinglmair (2015) for the necessity-driven self-employed. This suggests that the solo self-employed are a more vulnerable group in the workforce than the wage-employed or employer entrepreneurs, in line with Fachinger and Frankus (2017).

Second, do the consequences of precarious employment for well-being differ between the wage-employed and self-employed, and, within the latter group, between solo self-employed and employer entrepreneurs? This question is tested by considering if money worries or debt had more severe negative consequences for well-being for the self-employed than for the wage-employed. Results were not always significant but when they were, it was always in the direction of self-employed workers suffering more severe negative well-being consequences from financial distress, compared to wage-workers. In particular, financial distress has a greater negative association with physical health and life satisfaction for the solo self-employed (compared to wage-workers), while the negative association with mental health and quality of life was found to be most pronounced for the self-employed with employees.

A recent report by Binder (2018) finds that the UK's self-employed are more satisfied overall and that neither the physical nor the mental health of the self-employed are particularly different to their employee counterparts. This current article finds similar results in that the (solo) self-employed do not have worse health than the wage-employed. Although it takes a broader perspective than the UK by studying a European data base, the results have similar policy implications. Binder (2018) outlines the importance of considering subjective well-being in policy creation for the self-employed. He suggests that policies should focus on objective economic factors such as income and job creation but also on subjective factors such as confidence, stress and worries which also contribute to the overall well-being of the self-employed. In line with this recommendation, our article shows that such objective and subjective factors reinforce each other in the sense that economic factors such as income, or more generally, one's financial situation, are directly linked to well-being factors related to health and happiness. And our results find these links to be even stronger for the self-employed. Hence, self-employment policies focusing on economic and well-being factors should be considered in tandem with each other. Policies focusing on the self-employed should consider the economic situation of the self-employed but also their broader well-being in terms of health and happiness. Improving the well-being of the self-employed will benefit not only the self-employed but also society as a whole (Binder, 2018).

A limitation of our work is that our database is cross-sectional in nature. This article does not claim to have found causal relationships. The importance of our work has been to establish new statistical associations between employment status, well-being and financial health, so as to identify if problems related to precariousness are more severe within wage-employment or self-employment, both in terms of the share within each employment status category that is in financial distress, but also in terms of health consequences.

In summary, these findings show that, relative to wage workers, particularly solo self-employed workers find themselves more often in a precarious position in terms of having poor financial health (money worries) and also in terms of suffering more severe well-being consequences in case they have financial problems. A further policy implication of these results is that if labor force participants are stimulated to become entrepreneurs, policy makers should not only consider the short-term economic benefits of such initiatives (e.g., potential job creation), but also the longer-term consequences for the individuals involved. These long-run consequences may involve an increased risk of ending up in a precarious financial situation, which in turn could have a strongly negative impact on their well-being. Such risk is particularly prevalent if individuals start businesses from a modest personal financial situation.

Endnotes

¹ Austria, Belgium, Switzerland, Germany, Denmark, Spain, France, Greece, Italy, Netherlands, Sweden and Israel participated from Wave 1 onwards; Czech Republic, Ireland and Poland joined in Wave 2; Estonia, Hungary, Portugal and Slovenia joined in Wave 4; Luxembourg in Wave 5 and Croatia in Wave 6.

² That the general relationship between financial distress and well-being is negative was found in 7 out of 8 cases in the second panel of Table 8 (Financial Health variables), while the remaining case was not significant (i.e. the relationship between debt and life satisfaction).

³ To be precise, Hypothesis 2a is confirmed for 3 out of 8 cases in the first two columns of the third panel of Table 8 (Interaction Terms) while the other five cases are not significant.

⁴ This particular result holds only for Money Worries, not for Debt.

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Tables

Table 1. Variable descriptions

VARIABLE	QUESTION REFERENCE	SURVEY QUESTION	CODING
POOR HEALTH	PH006	Has a doctor ever told that you had one of the following conditions?	1 if any of a list of 20 health conditions, 0 otherwise.*
DEPRESSION	MH002	In the last month, have you been sad or depressed?	1 if yes, 0 otherwise.
LIFE SATISFACTION	AC012	How satisfied are you with your life?	0 to 10 where 10 is completely satisfied.
QUALITY OF LIFE	AC022	How often, on balance, do you look back on your life with a sense of happiness? Never, rarely, sometimes or often?	1 to 4, where 1 is never and 4 is often.
SELF-EMPLOYED	EP009	In your current main job are you a private-sector employee, a public sector employee or self-employed?	1 if Self-employed, 0 if Wage-employed (either in private sector or public sector).
WITH EMPLOYEES	EP024	How many employees, if any, do you have in this job?	1 if no. of employees ≥ 1; 0 if no. of employees = 0 (solo self-employed)
JOB DEMAND	EP027/EP028	My job is physically demanding/ I am under constant time pressure due to a heavy workload.	1 if agree or strongly agree with either statement, 0 otherwise (strongly disagree, disagree or neutral).
(LACK OF) JOB CONTROL	EP029	I have very little freedom to decide how I do my work.	1 if agree or strongly agree, 0 otherwise.
HOURS WORKED	EP013	How many hours a week do you work in a usual working week?	Number of hours.
MONEY WORRIES	AC019	How often do you think that shortage of money stops you from doing the things you want to do?	1 if often or sometimes, 0 if rarely or never.
DEBT	AS054	Excluding mortgages or money owed on land, property or firms, which of these types of debts do you currently have, if any?	1 if debt apart from mortgages or money owed on land, property or firms, 0 otherwise.**
GENDER (MALE)	DN042	Male or Female	1 for male, 0 otherwise.
AGE	DN003	In which month and year were you born?	Age expressed in years at time of interview.
EDUCATION	DN041	How many years have you been in full-time education?	Number of years.
MARITAL STATUS	DN014	What is your marital status?	1 for married or registered partnership, 2 for separated or divorced, 3 for never married and 4 for widowed.
CHILDREN	CH001	How many children do you have that are still alive?	Number of children.
MOTHER ALIVE	DN026_1	Is your natural mother still alive?	1 if yes, 0 otherwise.
FATHER ALIVE	DN026_2	Is your natural father still alive?	1 if yes, 0 otherwise
INDUSTRY	EP018	What kind of business, industry or services do you work in?	0 to 14 for different industry types (entered as dummies in regressions).

Note: We list the SHARE survey reference number, the question asked in the questionnaire and how we coded the answer for each of our dependent and independent variables.

* The 20 health conditions are: A heart attack or other heart problems; high blood pressure or hypertension; high blood cholesterol; a stroke or cerebral vascular disease; diabetes or high blood sugar; chronic lung disease; cancer or malignant tumour; stomach or duodenal ulcer; peptic ulcer; Parkinson disease; cataracts; hip fracture; other fractures; Alzheimer's disease; dementia, organic brain syndrome, senility or any other serious memory impairment; other affective or emotional disorders, including anxiety, nervous or psychiatric problems; rheumatoid arthritis; osteoarthritis, or other rheumatism; chronic kidney disease; other conditions not yet mentioned.

** The types of debt are debt on cars and other vehicles, debt on credit cards / store cards, loans (from bank, building society or other financial institution), debts to relatives or friends, student loans, overdue bills (phone, electricity, heating, rent), other.

Table 2. Descriptive statistics

	WAGE-EMPLOYED	SELF-EMPLOYED	SELF-EMPLOYED WITH EMPLOYEES	SOLO SELF-EMPLOYED	OBSERVATIONS
NO. OF OBSERVATIONS	51,836	6,852	4,393	2,459	58,688
<u>DEPENDENT VARIABLES</u>					
POOR HEALTH	0.592 (0.491)	0.565*** (0.496)	0.559 (0.497)	0.577*** (0.494)	54,827
DEPRESSION	0.351 (0.477)	0.315*** (0.467)	0.302 (0.459)	0.339*** (0.473)	39,794
LIFE SATISFACTION	7.898 (1.510)	7.918*** (1.532)	8.000 (1.468)	7.757*** (1.639)	54,355
QUALITY OF LIFE	3.425 (0.794)	3.431* (0.788)	3.447 (0.788)	3.399*** (0.787)	54,827
<u>EMPLOYMENT VARIABLES</u>					
JOB DEMAND	0.155 (0.361)	0.215*** (0.411)	0.237 (0.425)	0.173*** (0.378)	54,827
(LACK OF) JOB CONTROL	0.193 (0.395)	0.122*** (0.327)	0.126 (0.332)	0.112*** (0.316)	54,827
HOURS WORKED	36.606 (11.699)	42.527*** (18.786)	43.957 (18.288)	39.793*** (19.349)	54,827
<u>FINANCIAL HEALTH VARIABLES</u>					
MONEY WORRIES	0.483 (0.500)	0.487* (0.500)	0.443 (0.497)	0.572*** (0.495)	54,827
DEBT	0.537 (0.499)	0.523*** (0.500)	0.513 (0.500)	0.541 (0.498)	54,827
<u>DEMOGRAPHIC CONTROLS</u>					
GENDER (MALE)	0.444 (0.497)	0.612*** (0.487)	0.631 (0.483)	0.575*** (0.494)	54,827
AGE	56.115 (4.429)	57.009*** (4.568)	57.541 (4.432)	55.959*** (4.652)	54,827
EDUCATION	12.593 (3.986)	12.265*** (4.483)	12.391 (4.523)	12.129*** (4.430)	30,502
MARRIED	0.384 (0.486)	0.409*** (0.492)	0.268 (0.443)	0.685*** (0.465)	54,253
DIVORCED	0.064 (0.245)	0.058*** (0.492)	0.034 (0.182)	0.104*** (0.305)	54,827
NEVER MARRIED	0.037 (0.188)	0.035** (0.183)	0.016 (0.125)	0.072*** (0.258)	54,827
WIDOWED	0.018 (0.131)	0.015*** (0.120)	0.011 (0.104)	0.022*** (0.148)	54,827
CHILDREN	2.041 (1.256)	2.105*** (1.301)	2.172 (1.308)	1.967*** (1.275)	41,831
MOTHER ALIVE	0.418 (0.493)	0.411*** (0.492)	0.421 (0.494)	0.393*** (0.488)	54,827
FATHER ALIVE	0.204 (0.403)	0.194*** (0.395)	0.188 (0.391)	0.205*** (0.404)	54,827

Mean values of our dependent and independent variables are reported within each category of employment status, with standard deviations in brackets. We conducted t-tests of the differences in mean values, between the wage-employed and self-employed and between the self-employed with employees and the solo self-employed.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

Table 3. Descriptive Statistics by Country

	Money Worries			Debt		
	<i>Wage Employed</i>	<i>Self Employed Employees</i>	<i>With Solo Self-Employed</i>	<i>Wage Employed</i>	<i>Self Employed Employees</i>	<i>With Solo Self-Employed</i>
Austria	0.355 (0.479)	0.325 (0.469)	0.491 (0.501)	0.489 (0.500)	0.560 (0.497)	0.459 (0.500)
Belgium	0.415 (0.493)	0.371 (0.483)	0.500 (0.501)	0.525 (0.499)	0.533 (0.499)	0.537 (0.500)
Switzerland	0.318 (0.466)	0.273 (0.446)	0.286 (0.453)	0.401 (0.490)	0.361 (0.481)	0.493 (0.502)
Germany	0.436 (0.496)	0.311 (0.464)	0.456 (0.499)	0.507 (0.500)	0.506 (0.500)	0.527 (0.500)
Denmark	0.274 (0.446)	0.234 (0.424)	0.314 (0.466)	0.609 (0.488)	0.487 (0.500)	0.571 (0.497)
Spain	0.573 (0.495)	0.570 (0.495)	0.630 (0.484)	0.506 (0.500)	0.529 (0.499)	0.457 (0.499)
France	0.582 (0.493)	0.540 (0.499)	0.632 (0.483)	0.613 (0.487)	0.602 (0.490)	0.622 (0.486)
Greece	0.787 (0.409)	0.699 (0.459)	0.874 (0.333)	0.589 (0.492)	0.517 (0.500)	0.684 (0.466)
Italy	0.581 (0.493)	0.532 (0.499)	0.632 (0.483)	0.501 (0.500)	0.491 (0.500)	0.524 (0.500)
Netherlands	0.263 (0.440)	0.185 (0.389)	0.302 (0.461)	0.414 (0.493)	0.413 (0.493)	0.457 (0.499)
Sweden	0.306 (0.461)	0.297 (0.458)	0.384 (0.488)	0.610 (0.488)	0.507 (0.501)	0.496 (0.501)
Israel	0.609 (0.488)	0.488 (0.501)	0.520 (0.505)	0.708 (0.455)	0.729 (0.445)	0.780 (0.418)
Czechia	0.644 (0.479)	0.465 (0.500)	0.652 (0.477)	0.520 (0.500)	0.506 (0.501)	0.470 (0.500)
Ireland	0.460 (0.500)	0.378 (0.490)	0.489 (0.506)	0.577 (0.495)	0.600 (0.495)	0.511 (0.506)
Poland	0.655 (0.476)	0.653 (0.478)	0.779 (0.416)	0.503 (0.500)	0.510 (0.502)	0.572 (0.496)
Estonia	0.664 (0.472)	0.590 (0.493)	0.677 (0.470)	0.543 (0.498)	0.545 (0.499)	0.604 (0.492)
Hungary	0.745 (0.436)	0.679 (0.476)	0.680 (0.471)	0.528 (0.500)	0.536 (0.508)	0.580 (0.499)
Portugal	0.758 (0.429)	0.760 (0.430)	0.787 (0.412)	0.614 (0.487)	0.573 (0.498)	0.627 (0.487)
Slovenia	0.585 (0.493)	0.480 (0.501)	0.588 (0.497)	0.509 (0.500)	0.440 (0.498)	0.341 (0.500)
Luxembourg	0.409 (0.492)	0.345 (0.480)	0.452 (0.506)	0.574 (0.499)	0.582 (0.498)	0.645 (0.486)
Croatia	0.659 (0.474)	0.462 (0.508)	0.500 (0.535)	0.616 (0.487)	0.500 (0.510)	0.750 (0.463)

Descriptive statistics of the measures of financial health for categories of employment status by country. Mean values are reported, and standard deviations are given in brackets. Countries are listed in order of their participation in the SHARE project.

Table 4. Pooled Logit Regression Coefficients for Poor Health

	Model (1)	Model (2)	Model (3)	Model (4)
<i>Employment Variables</i>				
<i>Self-Employed</i>	-0.101** (0.044)	-0.153** (0.073)		
<i>Self-Employed With Employees</i>			-0.09 (0.065)	-0.143 (0.104)
<i>Solo Self-Employed</i>			-0.109** (0.047)	-0.191** (0.084)
<i>Job Demand</i>	0.137*** (0.045)	0.136*** (0.045)	0.136*** (0.045)	0.136*** (0.045)
<i>(Lack of) Job Control</i>	-0.006 (0.023)	-0.004 (0.023)	-0.005 (0.023)	-0.004 (0.023)
<i>Log Hours Worked</i>	-0.119*** (0.039)	-0.12*** (0.039)	-0.12*** (0.04)	-0.122*** (0.039)
<i>Financial Health Variables</i>				
<i>Money Worries</i>	0.278*** (0.05)	0.259*** (0.047)	0.279*** (0.05)	0.259*** (0.047)
<i>Debt</i>	0.239*** (0.033)	0.237*** (0.037)	0.239*** (0.033)	0.238*** (0.037)
<i>Interaction Terms</i>				
<i>Self-Employed * Money Worries</i>		0.114* (0.069)		
<i>Self-Employed * Debt</i>		0.006 (0.071)		
<i>With Employees * Money Worries</i>				-0.009 (0.073)
<i>With Employees * Debt</i>				-0.093 (0.09)
<i>Solo * Money Worries</i>				0.251*** (0.082)
<i>Solo * Debt</i>				0.095 (0.107)
<i>Demographic Controls</i>				
<i>Gender (male)</i>	0.068 (0.047)	0.068 (0.047)	0.067 (0.047)	0.068 (0.047)
<i>Age</i>	0.147** (0.062)	0.146** (0.062)	0.147** (0.062)	0.147** (0.061)
<i>Age Squared</i>	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
<i>Education</i>	-0.012* (0.007)	-0.012* (0.007)	-0.012* (0.007)	-0.012* (0.007)
<i>Divorced</i>	0.027 (0.049)	0.028 (0.05)	0.027 (0.05)	0.029 (0.05)
<i>Never Married</i>	0.042 (0.066)	0.041 (0.066)	0.042 (0.066)	0.042 (0.066)
<i>Widowed</i>	0.151* (0.082)	0.151* (0.081)	0.152* (0.081)	0.153* (0.081)
<i>Children</i>	-0.025 (0.016)	-0.025 (0.015)	-0.025 (0.016)	-0.025* (0.015)
<i>Mother Alive</i>	-0.123*** (0.035)	-0.122*** (0.035)	-0.123*** (0.035)	-0.122*** (0.035)
<i>Father Alive</i>	-0.101* (0.055)	-0.102* (0.055)	-0.101* (0.055)	-0.1* (0.055)
<i>Country Dummies</i>	YES	YES	YES	YES
<i>Industry Dummies</i>	YES	YES	YES	YES
<i>No of observations</i>	22,109	22,109	22,109	22,109
<i>Pseudo R²</i>	0.0329	0.0330	0.0329	0.0332

We list the results for four models using the same dependent variable, Poor Health. The first and second models have Self-Employed as the main independent variable, without and with interaction terms, the third and fourth with Self-Employed With Employees and Solo Self-Employed as the main independent variables, without and with interaction terms. Standard errors are in brackets and are clustered at the country level.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

Table 5. Pooled Logit Regression Coefficients for Depression

	Model (1)	Model (2)	Model (3)	Model (4)
<i>Employment Variables</i>				
<i>Self-Employed</i>	-0.013 (0.051)	-0.016 (0.106)		
<i>Self-Employed With Employees</i>			0.016 (0.079)	-0.065 (0.137)
<i>Solo Self-Employed</i>			-0.037 (0.058)	0.033 (0.124)
<i>Job Demand</i>	0.21*** (0.039)	0.209*** (0.039)	0.209*** (0.039)	0.209*** (0.039)
<i>(Lack of) Job Control</i>	0.115** (0.045)	0.116** (0.045)	0.116** (0.045)	0.117*** (0.045)
<i>Log Hours Worked</i>	-0.074** (0.034)	-0.074** (0.034)	-0.076** (0.036)	-0.077** (0.037)
<i>Financial Health Variables</i>				
<i>Money Worries</i>	0.424*** (0.04)	0.412*** (0.045)	0.425*** (0.041)	0.412*** (0.045)
<i>Debt</i>	0.185*** (0.059)	0.176*** (0.061)	0.185*** (0.059)	0.177*** (0.06)
<i>Interaction Terms</i>				
<i>Self-Employed * Money Worries</i>		0.074 (0.091)		
<i>Self-Employed * Debt</i>		0.054 (0.114)		
<i>With Employees * Money Worries</i>				0.218** (0.105)
<i>With Employees * Debt</i>				0.027 (0.135)
<i>Solo * Money Worries</i>				-0.055 (0.11)
<i>Solo * Debt</i>				0.059 (0.17)
<i>Demographic Controls</i>				
<i>Gender (male)</i>	-0.562*** (0.064)	-0.562*** (0.064)	-0.562*** (0.064)	-0.562*** (0.064)
<i>Age</i>	0.188* (0.106)	0.186* (0.105)	0.188* (0.106)	0.186* (0.105)
<i>Age Squared</i>	-0.002* (0.001)	-0.002* (0.001)	-0.002* (0.001)	-0.002* (0.001)
<i>Education</i>	0.011 (0.007)	0.011 (0.007)	0.011 (0.007)	0.011 (0.007)
<i>Divorced</i>	0.272*** (0.039)	0.273*** (0.039)	0.273*** (0.039)	0.274*** (0.039)
<i>Never Married</i>	0.154** (0.064)	0.153** (0.064)	0.155** (0.065)	0.156** (0.064)
<i>Widowed</i>	0.575*** (0.118)	0.574*** (0.118)	0.575*** (0.118)	0.574*** (0.118)
<i>Children</i>	0.012 (0.02)	0.012 (0.02)	0.012 (0.02)	0.012 (0.02)
<i>Mother Alive</i>	-0.082* (0.046)	-0.082* (0.046)	-0.082* (0.046)	-0.082* (0.046)
<i>Father Alive</i>	0.053 (0.046)	0.053 (0.046)	0.053 (0.046)	0.052 (0.045)
<i>Country Dummies</i>	YES	YES	YES	YES
<i>Industry Dummies</i>	YES	YES	YES	YES
<i>No of observations</i>	18,052	18,052	18,052	18,052
<i>Pseudo R²</i>	0.0621	0.0621	0.0621	0.0623

We list the results for four models using the same dependent variable, Depression. The first and second models have Self-Employed as the main independent variable, without and with interaction terms, the third and fourth with Self-Employed With Employees and Solo Self-Employed as the main independent variables, without and with interaction terms. Standard errors are in brackets and are clustered at the country level.

* if p < 0.10, ** if p < 0.05, *** if p < 0.01

Table 6. Ordered Logit Regression Results for Life Satisfaction

	Model (1)	Model (2)	Model (3)	Model (4)
<i>Employment Variables</i>				
<i>Self-Employed</i>	0.007* (0.004)	0 (0.009)		
<i>Self-Employed With Employees</i>			0.007* (0.004)	0.004 (0.009)
<i>Solo Self-Employed</i>			0.007 (0.005)	-0.004 (0.012)
<i>Job Demand</i>	-0.021*** (0.004)	-0.021*** (0.004)	-0.021*** (0.004)	-0.021*** (0.004)
<i>(Lack of) Job Control</i>	-0.021*** (0.004)	-0.021*** (0.004)	-0.021*** (0.004)	-0.021*** (0.004)
<i>Log Hours Worked</i>	0.013*** (0.004)	0.013*** (0.004)	0.013*** (0.004)	0.013*** (0.004)
<i>Financial Health Variables</i>				
<i>Money Worries</i>	-0.091*** (0.008)	-0.089*** (0.009)	-0.091*** (0.008)	-0.089*** (0.009)
<i>Debt</i>	-0.002 (0.004)	0.001 (0.004)	-0.002 (0.004)	0.001 (0.004)
<i>Interaction Terms</i>				
<i>Self-Employed * Money Worries</i>		-0.007 (0.009)		
<i>Self-Employed * Debt</i>		-0.019* (0.011)		
<i>With Employees * Money Worries</i>				-0.004 (0.007)
<i>With Employees * Debt</i>				-0.007 (0.012)
<i>Solo * Money Worries</i>				-0.01 (0.013)
<i>Solo * Debt</i>				-0.03** (0.013)
<i>Demographic Controls</i>				
<i>Gender (male)</i>	-0.005 (0.004)	-0.005 (0.004)	-0.005 (0.004)	-0.005 (0.004)
<i>Age</i>	-0.019*** (0.005)	-0.019*** (0.005)	-0.019*** (0.005)	-0.019*** (0.005)
<i>Age Squared</i>	0*** (0)	0*** (0)	0*** (0)	0*** (0)
<i>Education</i>	0.001*** (0)	0.001*** (0)	0.001*** (0)	0.001*** (0)
<i>Divorced</i>	-0.047*** (0.004)	-0.048*** (0.004)	-0.047*** (0.004)	-0.048*** (0.004)
<i>Never Married</i>	-0.038*** (0.005)	-0.038*** (0.005)	-0.038*** (0.005)	-0.038*** (0.005)
<i>Widowed</i>	-0.058*** (0.005)	-0.058*** (0.005)	-0.058*** (0.005)	-0.058*** (0.005)
<i>Children</i>	0.008*** (0.002)	0.008*** (0.002)	0.008*** (0.002)	0.008*** (0.002)
<i>Mother Alive</i>	0.003 (0.003)	0.003 (0.003)	0.003 (0.003)	0.003 (0.003)
<i>Father Alive</i>	0.004 (0.004)	0.004 (0.004)	0.004 (0.004)	0.004 (0.004)
<i>Country Dummies</i>	YES	YES	YES	YES
<i>Industry Dummies</i>	YES	YES	YES	YES
<i>No of observations</i>	21,959	21,959	21,959	21,959
<i>Pseudo R²</i>	0.0572	0.0573	0.0572	0.0573

We list the results for four models using the same dependent variable, Life Satisfaction. The first and second models have Self-Employed as the main independent variable, without and with interaction terms, the third and fourth with Self-Employed With Employees and Solo Self-Employed as the main independent variables, without and with interaction terms. Marginal effects for the ordered logit models are reported. Standard errors are in brackets and are clustered at the country level. * if p < 0.10, ** if p < 0.05, *** if p < 0.01

Table 7. Ordered Logit Regression Results for Quality of Life

	Model (1)	Model (2)	Model (3)	Model (4)
<i>Employment Variables</i>				
<i>Self-Employed</i>	0.018** (0.008)	0.031 (0.022)		
<i>Self-Employed With Employees</i>			0.031** (0.013)	0.058** (0.027)
<i>Solo Self-Employed</i>			0.007 (0.012)	0.002 (0.026)
<i>Job Demand</i>	-0.017* (0.009)	-0.017* (0.009)	-0.018* (0.009)	-0.017* (0.009)
<i>(Lack of) Job Control</i>	-0.038** (0.016)	-0.039** (0.016)	-0.038** (0.016)	-0.039** (0.016)
<i>Log Hours Worked</i>	0.027*** (0.008)	0.027*** (0.008)	0.026*** (0.008)	0.027*** (0.008)
<i>Financial Health Variables</i>				
<i>Money Worries</i>	-0.113*** (0.012)	-0.106*** (0.013)	-0.112*** (0.012)	-0.106*** (0.013)
<i>Debt</i>	-0.022** (0.009)	-0.019* (0.01)	-0.022** (0.009)	-0.019* (0.01)
<i>Interaction Terms</i>				
<i>Self-Employed * Money Worries</i>		-0.043** (0.021)		
<i>Self-Employed * Debt</i>		-0.016 (0.021)		
<i>With Employees * Money Worries</i>				-0.05** (0.023)
<i>With Employees * Debt</i>				0.007 (0.027)
<i>Solo * Money Worries</i>				-0.031 (0.029)
<i>Solo * Debt</i>				-0.038 (0.03)
<i>Demographic Controls</i>				
<i>Gender (male)</i>	-0.02 (0.013)	-0.021 (0.013)	-0.02 (0.013)	-0.021 (0.013)
<i>Age</i>	0 (0.015)	0 (0.015)	0 (0.015)	0 (0.015)
<i>Age Squared</i>	0 (0)	0 (0)	0 (0)	0 (0)
<i>Education</i>	0.006*** (0.001)	0.006*** (0.001)	0.006*** (0.001)	0.006*** (0.001)
<i>Divorced</i>	-0.15*** (0.018)	-0.15*** (0.018)	-0.15*** (0.018)	-0.15*** (0.018)
<i>Never Married</i>	-0.115*** (0.015)	-0.115*** (0.015)	-0.115*** (0.015)	-0.115*** (0.015)
<i>Widowed</i>	-0.094*** (0.022)	-0.093*** (0.022)	-0.093*** (0.022)	-0.093*** (0.022)
<i>Children</i>	0.017*** (0.004)	0.017*** (0.004)	0.017*** (0.004)	0.017*** (0.004)
<i>Mother Alive</i>	0.008 (0.01)	0.008 (0.009)	0.008 (0.009)	0.008 (0.009)
<i>Father Alive</i>	-0.008 (0.009)	-0.008 (0.009)	-0.008 (0.009)	-0.008 (0.009)
<i>Country Dummies</i>	YES	YES	YES	YES
<i>Industry Dummies</i>	YES	YES	YES	YES
<i>No of observations</i>	21,959	21,959	21,959	21,959
<i>Pseudo R²</i>	0.0498	0.0500	0.0498	0.0501

We list the results for four models using the same dependent variable, Quality of Life. The first and second models have Self-Employed as the main independent variable, without and with interaction terms, the third and fourth with Self-Employed With Employees and Solo Self-Employed as the main independent variables, without and with interaction terms. Marginal effects for the ordered logit models are reported. Standard errors are in brackets and are clustered at the country level.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

Table 8. Summary of Main Findings

	<i>Employment Status Variables</i>			<i>Financial Health</i>		<i>Interaction Terms</i>					
	Self-Employed ¹	Self-Employed With Employees ³	Solo Self-Employed ³	Money Worries ¹	Debt ¹	Self-Employed Money Worries ²	Self-Employed Debt ²	With Employees Money Worries ⁴	With Employees Debt ⁴	Solo Money Worries ⁴	Solo Debt ⁴
Poor Health	-	n.s.	-	+	+	+	n.s.	n.s.	n.s.	+	n.s.
Depression	n.s.	n.s.	n.s.	+	+	n.s.	n.s.	+	n.s.	n.s.	n.s.
Life Satisfaction	+	+	n.s.	-	n.s.	n.s.	-	n.s.	n.s.	n.s.	-
Quality of Life	+	+	n.s.	-	-	-	n.s.	-	n.s.	n.s.	n.s.

This table summarises our main findings, highlighting the number of significant results (at the 10% significance level) for each variable and interaction term. + indicates a positive relationship (at the 10% level), - indicates a negative relationship (at the 10% level) and n.s. indicates not significant. For our Poor Health and Depression variables a positive sign indicates worse health and a negative sign better health. For our Life Satisfaction and Quality of Life variables a positive sign indicates greater well-being. For example, the self-employed have better physical health and higher levels of Life Satisfaction and Quality of Life, compared to the wage-employed.

¹ Based on model (1) in Tables 4-7.

² Based on model (2) in Tables 4-7.

³ Based on model (3) in Tables 4-7.

⁴ Based on model (4) in Tables 4-7.

Human Resource Management

A Review of Spirituality at Work

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Abstract:

The study presented here is a multi-disciplinary literature review and extended discussion on the construct of Spirituality (S.) and its presence at work, its understanding by employees and organizations, its application in work life, as well as its positive effects on the workplace. Some fruits of spirituality are also revealed: trust, forgiveness, gratefulness, and compassion to name a few. Giacalone and Jurkiewicz (2003) collection of eminent works were used as a main point of reference, but the definition of S. here shifts from that of pure emotional *soulality*, as viewed in the management and organizational behavior literature, to that of the purely animus (life-propelling) force and meaning of the Spirit.

Keywords: spirituality, religion, work, organization, human

1 Research Purpose and Questions

Sixteen years after the thick volume on *Workplace Spirituality and Organizational Performance* that Robert Giacalone and Carole Jurkiewicz edited in 2003, is Spirituality (S.) at work clearer now than it was back then? Does it exist and why do we need to revive the discussion about it? Is it a concept or a construct? What are the studies that academics still need to embark on and what are the lessons that organizations still need to implement? What models are there that can be readily utilized?

The word S. is still in use and still fashionable in some organizational and academic circles. It is still looked upon with skepticism and shunned away from in most organizations. The purpose of this paper is not only to bring it back to the workplace map, but also to explore its true meaning in differentiation to “*soulality*” (the emotional striving for fulfillment of higher-order needs, as defined in this paper).

2 Design and Methodology

The methodology this study employed is an in-depth literature review, conceptual analysis, and thematic organization of the extant literature on S. in the fields of psychology, sociology, philosophy, management, HRD (Human Resources Development), OB (Organizational Behavior), and religious studies. This approach is similar to documentary analysis where the researcher looks at any number of themes embedded within the literature (e.g., articles, research, manuscripts). The unit of measure is what the researcher seeks to analyze, such as a concept, a word, an idea (McCulloch, 2004), but it is also compatible with content analysis of the literature (Krippendorff, 2012), which is another approach utilized here.

The study considered Cameron and Whetton's (1983) differentiation between a construct and a concept. Constructs do not have an objective reality to support them and cannot be observed, but can only be inferred from existence in people's minds. Contrarily, concepts "can be defined and exactly specified by observing objective events" (p. 7). In this study, Spirit is considered a construct that is unobservable directly, but Spirituality is a concept that can be observed (Dehler & Welsh, 2003).

3 The Literature

3.1 Proof of Spirituality in the Physical World

Rhodes (2003) reminded about the imaging capabilities that brain scientists developed for mapping brain activity. The method is called SPECT (single photon emission computed tomography), where pictures of the brain activity are taken immediately after people experience deep spiritual or meditative states. The brain serves the human spirit to convey the feelings and sensations; thus, creating a psychological state that realizes the connection with the human psyche. Such physical and psychological states can occur everywhere the human being is present: at home, at work, at leisure, at service, at worship, etc. If such states do occur at work, it is the individual's, the leaders', and the organization's responsibility to help them thrive like in any other ambiance.

3. 1. 1 Spiritual Laws

Marcic (1997) posited that S. is a concept that transcends the limits of the sensory world. "S., by definition, addresses the world of spirit, the soul, and the sacred. It is a world we cannot see or measure-the nonmaterial world-but it is around us just the same" (p. 2). S. is a means of connecting with the transcendent invisible world and is reflected in the relationships with the material world (how we treat people, the environment, work, etc.). In order to develop, S. first stems from the belief in that other world – something, which proves to be a struggle for many people. Marcic (1997) suggested the metaphor of the airplane. An airplane is a big bird weighing tons and it can still rise high in the sky beyond the common understanding of how exactly that is accomplished and by what physical laws. "It comes down to faith in something I cannot understand or explain." (p. 3). One's acceptance of the existence of spiritual laws does not make them less relevant (Marcic,1997). It is the same with Newton's law of consequences to all actions – a law valid in both the material and the spiritual worlds.

3.2 The Meaning of Spirituality

Going back to etymology, “spirit” is “breath” from the Latin “spiritus,” which is different from “anima” signifying “soul.” Thus, is S. at work spiritual in nature or does it have to do with the way various cultural and social needs are displayed? The answer is – there might be a religious root of the word “spirit,” but its current meaning at work has been modified in essence as seen in Giacalone and Jurkiewicz’s volume (2003). Dehler and Welsh (2003) say that “Spirit represents an inner source of energy, and spirituality the outward expression of that force” (p. 114).

3.2.1 Characteristics

Mitroff and Denton (1999) presented several characteristics of S.: 1) individual and personal, not necessarily related with religion; 2) belief in a supreme power or being that governs the entire universe (the author of this paper uses the word God); 3) knowing that things always work out for good because there is a plan that governs people’s lives (very much similar to what the Bible says in Romans 8:28 NIV) 4) the vocation of our existence - to do good in service to humankind; and lastly 5) S. is connected with care, hope, kindness, love, optimism, forgiveness, etc., which Marcic (1997) enriched with the new management virtues - trustworthiness, respect, dignity, justice, humility, and service. Rhodes (2003) summed various views of S. with the need to publicly acknowledge “the otherworldly, beyond physical dimensions of humankind” (p. 380). That is, S. exists only for those who believe that there is a world of the soul and spirit beyond the physical bodily existence.

3.2.2 Soulality

Spirituality can also be construed and thought of as a verb and “an open-ended process, a personal journey of exploration and discovery where the destination is unclear and the paths are emergent” (Ashforth & Pratt, 2003, p. 94). Overall, there is an academic agreement that it is subjective, fluid, and idiosyncratic. It will always stay that way through the lens of the human eye. This paper challenges that notion because there are spiritual laws, such as gravity, that should not be subjected to questioning and should not depend on human acceptance (Marcic, 1997). In the same line of thoughts, this paper disagrees with Furnham’s (2003) suggestion that S. can be secular for those people “who feel spirituality in nature or even poetry” (p. 257). Art, music, poetry, and nature are not living and do not have the Spirit of life in them. Thus, the connection with S. is not direct, rather indirect, as these creations can connect with the human spirit in a powerful way. The deep relationship that produces real S. is the personal connection with God and the Divine Spirit of life. Everything else just needs an alternate type of term to describe. It has to do with *soulality* and appreciation, but does not bring life per se, and it does not fulfill the need of divine connection. Furnham (2003) also stated that S. is an ability and a preference, which is partially true because although some people prefer to extinguish their spiritual longings and deny them in their lives, they still spend a lifetime searching for fulfillment and the missing piece. Zellars and Perrewe (2003) called it “the search and experience of the sacred” (p. 301). Their definition involved the belief in a Higher Being as well, which is adopted in this review.

3.2.3 The Spirit in Religion

Hill and Smith (2003) tried to make a distinction between Religion and Spirituality (RS) as human expressions in the context of another human expression - work. Hoge (1996) reported some statistics about the US society: 95% of the population believed in God, 90% said that religion is important in their lives, and 75% believed in Jesus Christ's divinity. In spite of this, the secularization theory is still wide at play and RS has been changed to a structural pluralism, which distinguishes between the private and public expressions. The public sphere is characterized by strong rationalism, in which personal religious beliefs are not thought to be relevant due to their mystic, personal, and intangibly spiritual character. The moral superiority of religion (R.) can only stand if it acknowledges the rational scientific claims of the public sphere. According to Hill and Smith (2003), many people believe that in the context of "religious individualism and privatization of experience" (p. 233) this has to be labeled differently than religion, religiosity, or religiousness. This paper claims that this is called *individual spiritualism*.

Hill and Smith (2003) blamed the overlapping identities of S. and R. on the fact that many people still think of S. in the frames of R. or practice it as such. RS, both, have sacred cores and both qualify for transcendence (beyond the self), not just a strong emotional experience. RS are providing a sense of meaning to people, which rational argument and science do not (Weber, 1964). There is also a distinction between dwelling S. and seeking S. Dwelling promotes certainty, control, security, clear difference between sacred, ordinary, and profane, as well as between community and freedom from restraints.

3.2.3.1 The Spirit in the Bible

In the Judeo-Christian tradition, it was God's Breath who gave life on earth (Genesis 1:1-2 NIV); hence, the Spirit is supernatural in essence. The Spirit is an ever-present, ubiquitous, incorporeal Being (God) that is creative and can bring to life and existence. In essence, the Spirit is Life (Genesis 2:7 NIV; Romans 8:2 NIV).

In addition, Yong (2004) writes, "The Christian assumption is that besides the Holy Spirit of God, there are other spirits, perhaps unholy ones - human, institutional, even demonic - that are operative in the world..." (p. 191). According to the Bible, indeed, demonic and negative spiritual influence does exist (1 Timothy 4:1; Job 4:15; Matthew 8:31; 1 Corinthians 10:20 NIV) and can even possess the human psyche (Matthew 12:45; Luke 8:30; Acts 19:16; Mark 1:23-26; Luke 4: 33-35, 41). Acceptance of such reports can make the scientific discussion and interpretation of S. rather complex because the subjective perceptions of different people could be obscured and distorted by spiritual possession.

3.2.3.2 The Doctrine of Vocation

The doctrine of vocation (DOV) was developed by Martin Luther and represents the main application of S. at work in the West. It is used in several ways: 1) to denote a profession "beruf," for deriving one's main income or 2) to denote a position in the family. Luther's ethics is partially humanely based because each person can decide independently what deeds are good; whereas, Christian ethics differs from humane ethics because it is based on the desire to imitate Christ and sacrifice personal wants

(Grenholm, 1993). DOV is also divided between the temporal life on earth and the spiritual life in the Kingdom of God. For the first one, humans have the vocation to serve each other and do good deeds for the promotion of civil righteousness; however, for the second, God requires only faith and faith alone. Spiritual righteousness is achieved solitary through belief in Christ, which is known in the Bible as grace – to receive a life undeserved and to not receive the punishment that is deserved. In Luther’s terms there are three views of DOV: 1) Human beings are co-creators with God through their work; 2) The purpose of work is to serve others and to promote what is good for them (the latter is done by the example of Christ, Who serves without expecting anything in return); and 3) Work is also a means for self-realization and cleansing of the flesh. It is a “fundamental condition of human existence” (Grenholm, 1993, p. 47).

3.2.3.3 The Spirit in Buddhist-Cristian Studies

Even though there is no exact equivalent of Spirit in Buddhist religion, there is a pneumatological approach to discourse that enables negotiation of norms and standards between religious hermeneutics (Amos, 2004). The Buddhist tradition speaks of Sunyata that liberates people to the truth – “a wondrous state of great freedom...” (Chang, 1971, p. 108), but “negates the laws of identity” (Yong, 2004, p. 202) in order to achieve enlightenment (in Christian terms - salvation). It is under the Buddhist and other Eastern religious (Taoism, Hinduism, Confucianism) influences, that some authors (Ashforth & Pratt, 2003) see S. as holism, balance, or harmony. However, harmony with what, and one whole with what (or whom)? These are critical questions in S., the answer to which changes the direction and the meaning of the concept.

3.2.4 The Spirit in Humanism

It is a natural mistake to identify the meaning of two etymologically different words (“soul” and “spirit”), which is frequently the case in the workplace context. People at work need to be a part of something, to be appreciated, to self-actualize (Maslow, 1954), to be in a meaningful social collective (Giacalone & Jurkiewicz, 2003). The latter can all stem from an intrinsic need, which, in fact, is not spiritual in nature because it belongs to the soul. In other words, the moral-ethical discernment of the Spirit (the fruits of the Spirit from Galatians 5:22-23) is simply humanism and human piety. The distinction of the humanistic and naturalistic from the supernatural allows for the fruits of the Spirit to exist apart from the divine grace - just based on human efforts.

Tepper (2003) excluded the belief in God from S., but said that this can contribute to spiritual strivings because the need for S. could be considered acquired, unlike McClelland’s (1961) learned needs. The author of this paper strongly opposes such view of S. on account of the following discussion of what S. is and how it displays in human life. The need for meaning and purpose is not at all acquired from the environment because it is not an emotional or physical need that is influenced by the surroundings. It is, rather, an innate need that comes with life and defines existence. Tepper’s S. looks very much like *soulality* or a higher-order need – personality and consciousness that are metaphysically referred to as spirit.

Gibbons’ (2000) interpretation of S. involved a sense of wholeness, connectedness of inner selves, deep values, profound meaning, and service to others.

The inner life dimension is based on the assumption that humans have an inner and an outer life. In Ashmos and Duchon's (2000) terms people have both minds and spirits. The built-in tendency for S. is what makes a person human and is expressed in a higher calling, something bigger than one's self, and a need for transcendence (Paloutzian, Emmons, & Keortge, 2003). Thus, the non-religious striving towards anything a person finds meaningful or valuable is acceptable; however, it should not be mistaken for S. because the semantics of the word require its connection with a spirit or the Spirit.

3.2.4.1 Spiritual Intelligence

Spiritual Intelligence (SI) is only natural to come to the fore after Daniel Goleman's (2012) Emotional Intelligence. The two concepts should be very closely related because the realm of the Spirit reflects in the emotional mirror of humans and produces spiritual fruits (could be both positive and negative). Emmons (2000) believes SI is: 1) the capacity for transcendence; 2) the ability to invest everyday activities, relationships, and events with the sense of the divine; 3) the ability to enter into heightened spiritual states of consciousness, and 4) the ability to use the spiritual to solve problems from everyday life. In sum, it is the ability to be sensitive to spiritual matters. The question about the source of this intelligence is more interesting – is it innate or is it acquired? The belief of this paper is that SI is Divine or innate from a creationist perspective. Human beings are meant to have a spiritual nature, but since it is so deep and intangible, as well as difficult to explain, it frequently remains in the background and somewhat neglected.

3.2.4.2 Consciousness and Spiritual Awareness

Barrett (2003) expanded Maslow's self-actualization idea towards spiritual awareness. He developed seven stages of personal consciousness and organizational consciousness, based on Maslow's (1954) hierarchy of needs: 1) Ensuring physical or economic survival; 2) Developing supportive relationships; 3) Building a sense of self-worth; 4) Balancing self-interest with collective interest through transformation; 5) Internal cohesion – developing a personal sense of mission and meaning; 6) Inclusion - making a difference in people's lives; and 7) Unity - serving humanity and the planet.

Barrett (2003) claimed that the human soul develops and separates from the human ego in the fourth stage of consciousness where one learns how to make a difference and contribution to others' lives. This stage is called "recovery of the soul" (p. 351) where in the process of personal transformation one learns how to balance the ego needs with the soul needs. The present review contends that each person's spiritual longing is the force that fuels stages five and six, where the individual realizes the need for personal life meaning and purpose. If the human spirit were not headed somewhere for eternity; then, why would the purpose of anything matter? Chance, coincidence, and gradual evolution do not create a spiritual vacuum that one searches to fill through a lifetime.

3.3 The Fruits of Spirituality

Outcomes from the exhibit of S. are called the *Fruits of the Spirit* in the Bible (Galatians 5:22-23 NIV); whereas, Paloutzian et al. (2003) called them an aspect of SI. The latter includes the capacity to engage in virtuous behaviors such as compassion,

gratitude, forgiveness, humility, love, and others. Even wisdom is included as a benefit resulting from S. Marcic (1997) said that due to our spiritual natures we can acquire virtues such as respect, trustworthiness, patience, and love that should accompany us everywhere and “should be practiced in a factory as much as in a temple” (p. 9).

3.3.1 Forgiveness

Thomson and Shahan (2003) traced the journey of a person during a transformation from transgression into forgiveness. The results of unhealed interpersonal relationships, for example, are lingering bitter feelings, negative thoughts, retaliation plans, and other unconstructive behaviors. The authors suggested going back to psychology basics and studying the concept of forgiveness as an effective coping skill, pertaining to the spiritual realm, which can free individuals of the negative feelings, thoughts, and behaviors at the workplace. Thompson and Shahan (2003) also created a five-stage model of the journey and outlined misconceptions about forgiveness. Forgiveness requires an active response of the affected individual to reframe the transgression. It does not exclude a pursuit of justice if the motivation is other than vengeful. The benefits of forgiveness as listed by Thomson and Shahan (2003) are: hope, satisfaction with life, job satisfaction, cognitive flexibility, absence of negative psychological symptoms, anger, anxiety, depression, vengeance, and rumination.

3.3.2 Autonomy and Freedom

Being able to take decisions at work, to have autonomy of actions, and to exercise responsibility are conditions pertaining to the human spirit. Conversely, “In a world in which some are told what to do by others” (Pfeffer, 2003, p. 35), quite the opposite reaction occurs – the spirit is suppressed and molded. In addition, fear as a motivator leads to internal competition, selfishness, loss of talent, demoralized staff, theft, and embezzlement – all negative moral issues, born by a bitter human spirit.

3.3.3 Service

Kurth (2003) explained serving is a natural expression of S. – a spiritual outcome, a product, a fruit. She recommended service as a way of spiritual renewing and inspiring ourselves at work. She defined spiritually inspired service as a way of being, not only an activity. It is also void of selfish motivation for gain and benefit. It is “actuated by love and the intent to contribute to the highest good of all” (p. 448).

Since a life of service is a personal choice, outside of work, it can also be a choice at work (Kurth, 2003), even though we are most accustomed to relating work with paid service. What is more, our workplaces are usually not explicitly supporting the expression of love and altruism because companies exist for increasing monetary profit and outperforming competition. In terms of the Christian vocation theory mentioned earlier, this can be interpreted as serving God through serving our fellow human beings at work. The key is to open oneself to a larger perspective and to transcend one’s personal desires. In addition, one can practice service through caring relationships at work, outside of work, in the family, or in one’s individual circles of interest. Service entails support of others’ personal and professional growth, responding to others’

needs, trusting them, and communicating honestly with them. It is done together with other people and lies in the basis of cohesive teams (Levi (2016).

Kurth (2003) also created a Four-Fold Spiritually Inspired Service Model of four quadrants: 1) Transcendental (serving the Divine through cultivating a conscious connection with Him at work); 2) Personal (serving self though commitment to spiritual growth and integrity at work); 3) Relational (serving others through establishing and maintaining caring relationships with them at work); and 4) Communal (serving the group through building caring environments and communities where we live and work together).

3.3.4 Hope

Hope at work has been undermined for the American worker today due to the changed working conditions: decline in long-tenure jobs and single careers, increase of part-time, contract, and contingent employment, as addressed by Turner, Barling, and Zachartos (2002). "As millions of Americans arrive at their place of employment, the unfortunate reality is that many see their work environment not as an opportunity, but as a place of mundane misery." (Adams, Snyder, Rand, King, Sigmon, & Pulvers, 2003, p. 368). If the last statement is true, then the American workplace is suffering from serious spiritual issues. Providing hope and a future is a legitimate human need and every employed individual (leader or follower) experiences it. The responsibility, however, not always lies on organizations' shoulders to cater to the needs of employees. Sometimes, employees just have to look at their workplace with hopeful outlook.

Adams et al. (2003) discussed the definition of "hope" from the agentic theory's perspective as a combination of goals (agency thoughts) and pathways for achieving the agencies. Hope "is a positive mental state in which motivation (agency) energizes employees to persist in their particular goal achievement" (p. 369). From here, it is logical that there are people with more hopeful thinking and people with less hopeful thinking, just like positive and negative affect. Finding new pathways for achieving one's goals at work is a feature of hopeful employees. Hopeful environments also aid to create hopeful employees. Avoiding burnout (hopelessness) for individuals and whole teams is the main goal of hopeful work environments. From McGregor's (1960) Theory Y, results a participative, engaging, and supportive corporate culture. Healthy companies provide hope, similar to Dimitrov's (2009) humane organization (HO) concept, where hope relates to social relationships at work, creativity, individuation, and growth. Lloyd (1990) called them "nice" (cooperative) companies, which tend to outperform the "nasty" (hostile) companies with about 86%.

3.3.5 Honesty and Trust

Elm (2003) said that the common definitions of honesty in the fields of moral philosophy and business ethics include telling the truth, integrity, respect of property ownership, being open and trust (a function of honesty) other human beings, which are also personality determined characteristics. Eml and Topensky (1998) conducted an honesty study among college students to determine that honesty is a multi-dimensional construct: 1) commission - telling the truth; 2) omission - when relating information to others; and 3) possession – stealing. Andrews (1989) recommended ethical therapy as

treatment for emotional and mental illnesses, based on the premises that deception has psychological, physiological, and why not spiritual consequences.

Being our whole selves involves honesty and the ability to trust others in all human relationships, even those at work. This is what boosts life and S. at the workplace. Elm (2003) presented a model of honesty, integrity, and workplace S., which suggested that honesty is a component of integrity, together with respect and courage, and they all lead to trust as a necessary ingredient in sustaining human relationships.

3.3.6 Gratitude

Simmel (1950) called gratitude “the moral memory of mankind” (p. 388) and qualified it as a cognitive-emotional supplement, which even though not part of S. could be seen as a spiritual output. Gratitude is also a social psychological dimension of the workplace that is an expression of SI (spiritual intelligence) and SWB (spiritual well-being) if performed regularly. Employees express gratitude and commitment when treated with compassion (by peers, managers, leaders, or the organization at large). Using gratitude in organizations will lead to higher giving and acknowledgement of the givers, which in turn will increase appreciation and engagement of employees.

Tepper (2003) found that S. influences organizational citizenship behavior (OCB) through gratefulness, need sensitivity, and inequity tolerance. Grateful behaviors benefit other coworkers and that psychological state becomes conducive to S. at work. The author’s propositions were that spiritual employees will be more grateful, show more sensitivity to others’ needs, and will have higher tolerance for inequity (situations that fall short of expectations). Such employees will cause other people to exhibit more frequent OCB as well (helping colleagues, not complaining, and speaking favorably of the organization to outsiders) and engage in more social exchange as a whole.

3.3.7 Humility

Another spiritual virtue is the state or condition of the spirit to be humble and modest, which the extant literature has associated with better adjustment, higher likability, fewer interpersonal conflicts, more stable relationships, and even lower risks of coronary heart disease (Tangney, 2000). The Bible also frequently encourages people to be humble (Proverbs 15:33; Matthew 23:12) and suggests that such disposition is pleasing to God, which attests to the spiritual connotation of humility.

3.3.8 Love

According to Marcic (1997) love is a fundamental component of the spiritual world and a necessary outcome to be displayed in work relationships. I Corinthians NIV 13: 1-13 is the oldest perfect description of the spiritual underpinnings of love. Love is kind, not selfish, not boastful, not angry. It trusts, protects, and hopes: “And now these three remain: faith, hope and love. But the greatest of these is love.” (1:13)

3.4 Spirituality and Management

Business, with S. in mind, becomes the sustainable new way of boosting productivity and achieving competitive edge. What would be the ethical and economic implications if all men and women knew what is right or wrong, good or bad, moral or immoral at work? “Good management is largely a matter of love” (Autry, 1991, p. 13). The quest continues fifteen years after Pfeffer’s 2003 article “Business and the Spirit: Management Practices That Sustain Values.” It all started with the reasoning that employees’ eyes are on the good or bad motives of their managers. Management’s intent (just as any human intent) becomes benevolent or malicious because of its spiritual connection. Organizational missions or management directions, which are in contradiction with who people are, send a destructive message to the spirit of workers (Pfeffer & Sutton, 2000); whereas, Dimitrov’s (2012) sources of meaningfulness at work could build the human spirit if supported by management.

To compel people to be different on the job and to conform their true selves and aspirations (among which spiritual) to an organizational prescription, is a destructive message to the animating, breath-instilling power of the Spirit. The true HOs – the ones that provide meaningful work, a community of values, and a benevolent mission (Dimitrov, 2009), are those who not only hang statements on walls, but live and practice what they preach. One of the most efficient management practices that build people’s spirits is letting them make decisions and be autonomous, which was also leads to job satisfaction (Hackman & Oldham, 1980). The existing hierarchical structures of most companies and government agencies are consistent with Taylorism, but unfortunately, leave most employees passive, disengaged and apathetic (Pfeffer, 2003). This strategy is, needless to say, not the most productive way of running things; however, it is still prevailing in many national cultures. In organizations in which supervisors take decisions for their employees, the latter are practically deprived of a job, and what is more – they are deprived of true humanness (Pfeffer, 2003). Autonomy was, thus, purposefully listed in the characteristic features of a HO (Dimitrov, 2009). People tend to resist any attempt to mold, shape, and constrain them. The only advice that remains for managers who want to have trustworthy employees is to trust them and prevent the self-fulfilling prophecies of monitored workers who do not trust their own selves (Pfeffer, 2003). However, anarchy is also not a sign of healthy management because people do need direction and inspiration to uncap their potential; “people will do a good job if they know what they need to do and are given the tools and training to succeed” (p. 39). In addition, managers who use fear drive good people away and only augment fraud and lies: “Fear and intimidation are anathema to building spirit in the workplace” (p. 41). We have the moral obligation to collectively guard organizations against breaking the human spirit and accepting the precept ‘the end justifies the means.’

3.4.1 Spirituality and Leadership

American business permeates with selfishness, erosion of civility, and materialism (Kolodonsky, Bowen, & Ferris, 2003). This is also combined with a widespread hunger for connectedness, meaning, and purpose that the authors call typical for the spirit-led lives of our species. Organizational politics is characterized by greed, pride, and selfish agenda-pushing, but is found to be different than political skills - “an ability to navigate political environments and to effectively influence others” (Kolodonsky,

Bowen, & Ferris, 2003, p. 165). Servant leaders are needed who possess both spiritual and political discernment to diminish the destructive type of organizational politics and inspire S. at work through instilling confidence and trust (both of which are spiritual fruits).

Fairholm's (1998) spiritual leadership and Greenleaf's (1977) servant leadership stem from the growing belief that people are the most important commodity in organizations today (Pfeffer, 1998). The individualistic manner of hierarchical management is found to be anti-community and anti-spirituality oriented. Self-serving behaviors in the workplace that appear to be unsanctioned qualify as organizational politics. The antidote is the type of leadership that embraces openness, altruism, and a spiritually-rich workplace (Kolodonsky, Bowen, & Ferris, 2003). The servant leadership that inspired many academics and businesses (Ritz Carlton, Walmart, Service Master, and Saturn) in the 90s is based on the Christian notion that true leadership (L.) belongs not to those who seek to rule, but to those who come to serve others. The politically astute leaders, who have power, presence, and discernment for their own and for others' behaviors draw on emotional, social, and spiritual intelligence: "...for potential followers to believe that a leader is truly putting their needs first and serving them, the leader must be authentic, genuine, sincere, and trustworthy, which are all hallmarks of political skill and critical to building a spiritual environment..." (Kolodonsky, Bowen, & Ferris, 2003, p. 173).

The servant-led organizations have a transformational effect when a higher level of morality and motivation are achieved through leader-follower collaboration. Servent L. is conducive to S. because it is based on listening to one's needs, wants, dreams, and concerns (Greenleaf, 1977). It lays the foundation for HOs (Dimitrov, 2009). It creates flow environments at work – the optimal experiences that people want to be involved in for the experience itself (Csikszentmihalyi, 1990). It welcomes spiritual exploration activities (Bible reading, contemplation, prayer, fostering inner peace, etc.), which lead to become more rested, clear thinking, and relaxed employees (Kolodonsky, Bowen, & Ferris, 2003).

3.4.2 Spirituality and Money

Belk (1991) differentiated between sacred and commodity money. The self-sacrificial donation and gift that are benevolent and service-oriented, also represent a spiritual outcome. The artist can produce commercially and earn profane money, as well as create for the soul and earn sacred money. Money meaning is determined by each individual and stems from the ethical systems of cultures and religions. The wealth ethics, the being, and romantic ethics are clearly opposed to each other in terms of value of S. and materialism.

Profits and stock prices are outcomes that should not suffocate the process of their achievement. To favor money-making to the detriment of the human spirit at work, calls for problems. Engaging the hearts, minds, and spirits of individuals is what companies of the future do: Southwest Airlines, AES, the Toyota-General Motors joint venture, SAS Institute, Men's Warehouse, Wild Hare's Restaurant (Pfeffer, 2003), Semco (Semler, 1995), and others.

According to classic economic theory, people come together in an organization for self-concern and economic interests, but the simple sum of the egotistical desires cannot take them to an endeavor bigger than that sum. “Moreover, what makes a corporation efficient or inefficient is not a series of well-oiled mechanical operations, but the working interrelationships, the coordination and rivalries, the team spirit and morale of the many people who work there and are in turn shaped by the corporation.” (Buchholz & Rosenthal, 2003, p. 155). According to these authors, pragmatic theory attempts to recover the intrinsic moral nature and purpose of the organization, which has been largely ignored. Corporate social responsibility has tried to counteract the largely perceived purpose of the organization - money and profit-making. Growth is not the mere accumulation or increase of consumption, but the quality of life.

Production and consumption are not ends in themselves, but must be made to serve a larger moral principle. The spiritualizing of the workplace and the marketplace...may wean both workers and consumers off the meaningless treadmill of ever continuing economic growth as the ultimate goal of society. (Buchholz & Rosenthal, 2003, p. 162).

3.5 Spirituality and Organizations

The founder of the High Tor Alliance - a Resource for Organization and Community Renewal, Christopher Schaefer (n.d.) talked about the spirit, soul, and body of an organization. He defined the spirit as the expression of mission, purpose, and history. On the other hand, the soul is expressed through the organizational culture and has three qualities: feel, think, and will. Schaefer was concerned about how the age of information technology affects people’s consciousness. He repeated ardently the three threats to humanity - the mechanization of the spirit, the vegetablization of the soul, and the animalization of the body.

3.5.1 Organizational Influence

Ashforth and Pratt (2003) wondered if there is such a thing as an individual exploration and personal S. within the constraints of a prefabricated organizational reality. Since S. is a personal on-going journey, how can corporate entities get involved? “An organization of course, can prompt an individual’s journey, channel his or her path, and suggest the ‘appropriate’ lessons to be derived” (p. 94). Whether the organization will channel this “commodity” well is not certain considering the organizations’ secular, rational, and tangible purpose of existence. This makes organizations frequently incompatible with S., which is similar to the P-O (personality –organization) fit dilemma. And yet, even though S. is personal it does not have to be private. Ashforth and Pratt (2003) think it can be shared in the form of values, goals, meaning, experiences, and beliefs. This is where the other organizational role comes in - enabling the individual to the above listed possibilities. Letting individuals find their own niche and interpretation of S. within the organization, however, presupposes excess diversity that may influence negatively for the P-O bond.

The organization can also direct S., by providing “top-down imposition of homogeneity” (Ashforth & Pratt, 2003, p. 98). The authors talked about an

organizational cosmology, imposed on working individuals in order to conform them to the organizational mission and practices. The choice of word 'cosmology' is strong here because it is a theoretical framework that determines who one is (identity), who one belongs to (membership), what matters (values), what needs to be done (purpose), and why things are what they are (ideology). The spiritual direction that an organization can exercise varies in strength on a continuum - from employee selection for P-O fit, to socialization by the values and principles of the organization, to partnering, and finally, to normative control and transformational leadership that inspire and motivate intrinsic conversion (Ashforth & Pratt, 2003). In some cases, contingent S. results (in the organization's interests), which is distant from the true, independent, and innate S. quest of the human being.

3.5.2 Types of Organizations Based on S. Involvement

Mitroff and Denton (1999) recognized several types of organizations on a continuum of business models: 1) Religious-Based Organizations (RBO) where the teachings of the Bible are guiding principles for conducting business and "God is not only the supreme supervisor but also the supreme designer of the jobs ... To take it a step further God is the ultimate owner of any business... God created work." (p. 63); 2) Evolutionary Organizations; 3) Recovering Organizations, 4) Socially Responsible Organizations (SRO); and 5) Value-Based Organizations (VBO), which reject religious or spiritual connotations, but work on values such as trust, love, and respect that are connected with S. Mitroff and Denton (1999) concluded that the modern successful organizations need to include explicit spiritual and religious language in defining their missions and in conducting their operations. The authors also claimed that S. will enhance human life in organizations.

3.5.3 The Right Organization

Pfeffer (2003) talked about high-commitment, people-centered companies that proclaim employment security, mutual commitment, selective recruitment for cultural fit, investment in training and development, decentralized decision-making, delegation of responsibilities and self-governance, as well as sharing information openly with all employee echelons. The motivation behind such practices carries spiritual connotations. The proliferation of management practices that are demoralizing and destructive to the human spirit make the quest for the exact opposite type of culture necessary. The HO (Dimitrov, 2009) has such culture – nourishing and sustaining the people's psyche, as well as liberating to their spirits. To deny people's emotional and spiritual selves at work in order to augment rationalization is detrimental to the success of the organization and the realization of the person (Pfeffer, 2003).

Schaefer confirmed the necessity of a different type of organization with a "spirituality-based social understanding" (p. 2, para. 1). In the article "Why Spirit Matters", Schaefer and Darling (1997) promoted work environments where people can express their values, instead of repress or change them. They explored S. in the workplace and how people manifested it. The categories they looked at were: individual meditation, individual practices at work, attitudes toward work, and organizational practices. The individual contemplative practices were more than the shared ones because leadership did not support it, because the culture did not support it, or the

working schedules were not flexible. The finding most relevant to the purposes of the present study was “that the contemplative and spiritual practices used in the workplace are beneficial and context-appropriate activities...” (Schaefer & Darling, 1997, p. 2).

3.6 Spirituality and Work

Furnham (2003) distinguished between work’s and spirituality’s goals because work as a social activity is frequently related to productivity and material advancement; whereas S. is a personal need rewarded only intrinsically. The values of honesty, integrity, accountability, justice, respect, cooperation, integrity, care, servitude, and others all fall “under the umbrella of spirituality” (Furnham, 2003, p. 258) because they are the fruits of S. They cannot be suspended at work, which should automatically connect the workplace with S. through those individuals who exhibit such virtues. From here on, S. meets with the local corporate culture that can either suppress or encourage S. for employees. The Protestant Work Ethic (PWE) is still considered the best illustration of applying spiritual (or religious) principles at work (Furham, 2003).

The combination of industrial revolution and enlightening humanism brought Western cultures to an increasingly secularized meaning of work as a means of income and perhaps some personal growth, but certainly opposite to S. (Hill & Smith, 2003). Dwellers are those spiritual people who seek meaning in their work beyond satisfying careers, but to fulfill a calling; and, if the latter exists, it usually points to the presence of Someone who calls. These same individuals also experience a higher sense of community, also blended in their work. Seekers focus more on the process of work and the personal benefits it provides - freedom, personal fulfillment, and individuality expression. The advantage from both types of orientation is that people “may be more likely than others to resist the pressures of materialism and commodification, the process whereby money becomes so dominant in society that everything and everyone is seen and treated as a commodity to be bought and sold” (Hill & Smith, 2003, p. 240). The authors also acknowledge better decision-making abilities, better communication and interpersonal relationships with others, and enhanced presence and awareness at work for such people.

3.6.1 Work-Life Balance and Workplace Spirituality

Another spiritual connection with work is when organizations make people choose between their work commitments and their family-and-friends life (Pfeffer, 2003). Hence, work-life balance (WLB) is seen as a spiritual need, in addition to being a lifestyle and a basic human need (Maslow, 1954). Pfeffer (2003) also emphasized that even though jobs are important, employees have significant social ties with people outside of work such as spouses, children, parents, friends, neighbors, etc. Organizations that steal from such essential commitments imprison their employees’ spirits by creating role conflicts and psychological stress. One should even beware from such WLB accommodations on the job as daycares, health clubs, libraries, slumber rooms, and play rooms, because they “merely make it easier never to leave work” (p. 39). On the other hand, the curse of technology is that cell phones and the internet have only “blurred the boundaries between work and nonwork” (p. 39). All these issues contribute to enslaving people’s spirits to work. Companies that allow employees to have simultaneously a job

and a life nurture human S. and create benign spiritual environments for them to produce better results.

3.7 Spirituality and the Law

The First Amendment to the Constitution of the US states that, “Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof.” (“U.S. Constitution,” n. d. para. 1). The free exercise clause was construed by the Court to protect persons from civil authorities’ control or intervention into religious beliefs and activities. The existing public rulings have historically involved formal religion, rather than spiritual expressions, and have primarily concerned employment compensation law and the role of government in endorsing or supporting religious expression (Rhodes, 2003).

The legal aspect is most relevant to government agencies in the US since they concern the level of S. public managers and employees are allowed. Rhodes (2003) suggested that the Council of Social Work Education adds spiritual development “to the social worker’s philosophy of human behavior” (p. 387) as another central factor besides biological, psychological, social, and cultural factors. The author also cites Louis Gawthrop (1998) on the need to integrate social, political, and organizational values with those of the individual administrator’s personal values. Thus, next to values such as equality, justice freedom, and responsibility that are considered part of the social and organizational ethics, we need to add personal spiritual virtues such as “benevolence, justice, kindness, and unselfishness” (Rhodes, 2003, p. 388). These core values already include S. and are driven by it, even though public workers need to steer away from endorsing religious expression. The claim this paper makes is that personal values and virtues are spiritually obtained and maintained for workers to utilize at work. As such, how fair is it to mandate entire separation and seclusion of the public employee from a workplace where S. can be freely lived?

3.7.1 Religious Conflicts and Legal Protection

When S. beliefs take the form of actual behaviors, conflicts are likely to occur in the workplace (White, 2003). The conflicts that arise are between an employee’s rights to practice his/her religion and an employer’s right to conduct the business cost efficiently. An additional complication is when religious minorities increase and the pluralistic diverse society presents traps in which the expression of spiritual and religious freedoms for one person might afoul those of another. Historically, in the US, the rights to a religion and a faith started being protected in the province of Maryland in 1640 with the Act of Toleration. Madison passed the Virginia Statute for Religious Freedom in 1776 to remove personal religious rights and beliefs from governmental control (White, 2003). Things started moving in the workplace in the 1950s, until when the doctrine of privilege prevailed. That doctrine gave the government the right to fire an employee based on religious beliefs. The court, however, did distinguish between thought and behavior and concluded that even though acting on one’s beliefs might be restricted, the right to believe what one will is absolute (Cantwell vs. Connecticut, in the 1940, as cited in White, 2003). Congress modified the Civil Rights Act in 1972 to “reasonably” accommodate religious expression if the cost is not prohibitive. Possible

accommodations that the federal government now allows are: compensatory schedules, change of assignments, lateral transfers, flexible scheduling, and substitutions.

The US president can also issue guidelines to limit religious expression in the government - the 1997 Guidelines on Religious Exercise and Religious Expression in the Federal Workplace by President Clinton. The guidelines allowed the government to restrict employees' religious rights when: 1) the government's provision for efficient performance prevails; 2) when the personal expression intrudes on the rights of other employees; or 3) when allowing the expression appears as endorsement of a particular religion by the government. Overall, "... the federal executive order contains a loose amalgam of religious policies, some contradictory, and with little relationship to legislation or court decisions" (White, 2003, p. 253).

3.8 Spirituality and National Cultures

McLean and Johansen (2006) suggested spiritual paths in different cultural religions that will help today's organizations solve the existing misunderstandings of what makes a person happy and satisfied. The emphasis in all spiritual trends is to consider the whole person with mind body, soul, and spirit, not just a person's material or status needs. The authors also combined the culturally formulated spiritual influence on how people feel in their workplaces. It could be argued that it all started with religion, which then confirmed the cultural differences expressed through people's souls (minds, emotions, personalities).

Furnham (2003) reviewed some cross-cultural studies related to SWB (spiritual well-being). He reported that individualistic cultures have higher SWB, but also higher suicide rates. Happiness and well-being correlated modestly with national affluence, but those who accept S. are not necessarily antimaterialists. Triandis (1995) suggested that individualistic cultures are more prone to welcoming and practicing seeking S., which makes the individual a center of thought, feeling, and behavior, independent of others. These cultures do not find a consensual belief system (shared by a group) to be as important.

4 Discussion of Workplace Spirituality

Work today is characterized by dynamism and constant change, white water-rafting (Vaill, 1996), and a complete redesign. The knowledge economy relies primarily on project-based tasks (problem identification and solution), interdependence of workers, and collaboration of groups and teams (Levi, 2017). Conventional management of passing and following directions should, thus, become obsolete because the majority of the new workers think, create, and solve problems for a living. This is the Experience era (post the Industrial and Service eras) of relationships, free agents, and internalization (Dehler & Welsh, 2003). Examples are Disney Company, Cirque du Soleil, and Volkswagen, who create distinct experiences that are unique, stand out, and are difficult to duplicate. The relationship between the producer and the consumer is the critical factor in this unique experience. The new economy leads to restructuring organizations towards flatter structures, greater flexibility, and more emotional type of labor. Unfortunately, the increase of free agents and project type of work, with no requirement for tenure, longevity, and loyalty, is a drawback. The latter could be

counteracted by treating people as their whole selves (body, mind, feelings, and spirit). The expectation of emotional involvement is already too high and some authors even call businesses “culty” (Welsh, 1998) because they require “buy-in” or “fit” with organizational values: “...organizations had become sterile places where individuals were not encouraged to be themselves” (Elm, 2002, p. 280). The caring organizations of Liedtka (1996), Dobson and White (1995), and Dimitrov’s (2009) HO are the ones that notice the above stated controversy and open pathways for remedy. The focus becomes the person as an end in him/herself, not as a means for profit, which leads to a byproduct of economic stability. The entire human psyche needs to become involved in organizational life to accomplish that focus. The question posed here is whether S. is part of the psyche or only connected, felt, and expressed through it? No evidence can ever support that inquiry. It is a matter of faith.

Work has become more and more central to the way we define ourselves and a main source of self-esteem, recognition, and socialization for many people. With that, its position is already too responsible; especially, because workers’ loyalty tends to lie more with work itself, with coworkers, with leaders, with customers, with friends, and less and less with one and the same employer. “The new workplace, then, becomes a place where people not only do work, but create an experience in the context of their work” (Dehler & Welch, 2003, p. 116). The sources of meaningfulness at the workplace (Dimitrov, 2012) become crucial as sources of inspiration and possible spiritual growth if channeled appropriately. There is now a critical starting point for a Theory of Spirituality at Work, which must be pursued further: “In conclusion, spirituality not only has a place in the new workplace, it is integral to what the new workplace represents. Contemporary organizations need to nurture employees spiritually by sharing responsibility to meet their spiritual needs.” (Dehler & Welch, 2003, p. 119).

5 Practical and Research Implications

This new discussion on the meaning of *spirituality* and *spirituality at work* will be especially beneficial to the new styles of management in a global economy of altered employment relationships. The new models of employee management and development, as well as the new spiritual features of leadership, will facilitate the connection between *Spirituality* and *Work*, *Spirituality* and *Organizations*. The increase of empirical studies of the concept of the Humane Organization, as suggested by Dimitrov (2009), will bring new light on the Spiritual Workplace and the Spiritual Organization. The present study revealed that to be human and work can only be accomplished by the whole person at work, which must include one’s spirit as well.

The results of the above suggested empirical studies will aim immediate implementation into the lives of millions and millions of working souls who carry spirits, as well as for the betterment and elevation of society at large. The quest will bring light into one philosophical and very existential question – who are we and where are we headed as species? In order to answer the latter, we must first understand what our beliefs are and what our assumptions for spirituality’s existence are. The present literature review with components of content analysis helped to define *Spirituality at Work* as a stepping stone on a new path of future research and organizational transformation.

6 Limitations

Empirical studies of S. are rare (Mitroff & Denton, 1999; Ashmos & Duchon, 2000) and suffer a number of limitations (working definitions, methodology, scope). More theories are needed to explain the connection among variables and more studies are suggested to empirically assess the various dimensions of S. From here on, S. can be sought as a variable that relates to productivity at work and work-life satisfaction, but it should never be treated as a commodity to be exploited by economic purposes.

Another limitation comes from the fact that people originate from a variety of backgrounds and hold very diverse worldviews. Thus, they can rarely reach a conclusion on one definition. The spiritual laws of the universe, however, should be as clear and well traced as the physical laws of gravity. Our pluralistic approaches should not hinder us from reaching the same goal of encouraging the quest of spirituality at work and everywhere in life.

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Improving services for people with disabilities and disabled entrepreneurs in Germany as a special business opportunity

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Abstract: In Germany consulting is one of the most rising (by up to 7 %) sectors, as a German study from 2016 demonstrates (BDU 2016). The consulting market is a big one with a lot of providers, and therefore it is more interesting to identify out consulting sectors that currently aren't being served by them, but where in the future the needs will rise and where providers will be expected to serve a new type of clients, such as consulting for people with disabilities.

This document contains information about the formatting requirements for the TAKE conference proceedings. Format your paper in Calibri 12pt (single-space) throughout, using bold and italics as appropriate. Full papers should be 5000 to 6000 words in length, whereas posters, working papers and doctoral workshop papers should have between 3000 and 4000 words. This includes the abstract, figures and references. References should be in the APA referencing style. The overall length of the paper, including tables, diagrams, charts, abstract and references must not exceed 15 pages. Page numbers will be added later by the typesetter. The abstract (100-200 words) summarizes the topic and important results presented in the paper. It should preferably not contain formulas, pictures, or references. After the abstract skip a line space.

Keywords: Consulting – people with disabilities – Germany – qualitative methods – narrative interviews

1 Introduction

Consulting is a huge sector in business and has a strong link to administration because of the need to collect information in a systematic way and in order to be able to analyze and optimize the core processes in business. Furthermore, the significance of the development of many societies into information societies has been rising not only because of technological developments but also because of the challenge of maintaining human development in a world with more and more demands and less and less resources, so that the lasts must be saved, and production processes must therefore be more and more optimized. This constraint is so important that even the political systems in many countries develop more and more laws to support this dynamic, for example by supporting electromobility, especially in Germany, where the largest car producers have missed this development and are now under pressure

to reduce the carbon dioxide emission. These circumstances are important reasons for consulting being one of the most rising (by up to 7 %), as a German study from 2016 demonstrates (BDU 2016).

The consulting market is nevertheless a big one, and therefore it is more interesting to identify out consulting sectors that currently aren't being served by many providers, but where in the future more of them are expected to enter the market, such as consulting for people with disabilities. The possibilities offered by different governments are fixed in law especially in German and this is why many administrative processes are involved in obtaining the aid, which is why people with disabilities have a need for consulting as consumers. In this paper we want to focus on two levels of consulting. At one level, people with disabilities can receive consulting as clients (passive participants in the economy) in order to benefit from the different aids offered, on another level as entrepreneurs (active participants in the economy). While as client's people with disabilities receive support from social workers and often from legal guardians, their support in the role of entrepreneurs is a new area with a different kind of consultants.

As a first step, we would like to concentrate on the more established role of people with disabilities as consumers. This is appropriate to analyze the degree of satisfaction of people with disabilities with the services offered. Therefore, it is important to consider the processes disabled people undergo until they can benefit from aid. Do long and complex administrative processes have negative consequences on the concerned person's perception of the help received? Or do short and simple administrative steps have a positive influence on the support offered? Isn't there a link between perception of service quality and administrative processes?

These questions indicate that it is important to verify the effect of administrative processes on the perception of quality of the services offered, including consulting

What are the elements of good consulting and which are the most important processes within it?

Here an assessment of the good and bad elements of consulting can provide information on the link between administration and perceived service quality. Germany as one of the strongest economies in the world, with a long tradition of measures to support people with disabilities, is a very interesting region for our purpose. That is why we want to do our research in Germany.

In a second step, we shall analyze the role of people with disabilities as entrepreneurs. Interviews (expert interviews) with disabled entrepreneurs of the Enterability project (a project that has won the 2015 European Enterprise Award) will be done, so that a deeper analysis of the required and available areas of consulting (strategic consulting, organization and process consulting, human resources consulting, IT consulting) can be elaborated. Are there similarities between consulting for people with disabilities as customers and as entrepreneurs? Does one form of consulting (for customers) work

better than the other (for entrepreneurs)? Do traditions in consulting for disabled customers make sense for disabled entrepreneurs?

In the third and last step, an expert interview with a consultant from the Enterability project will be done. We will confront him with the findings and work out positive and negative aspects of consulting services especially for the targeted groups and give advice.

2. Case studies an adequate method to analyze entrepreneurship of people with disabilities

Entrepreneurship by disabled people has only partially been sufficiently researched. At the same time, every professional knows that there is a separation between economics and social sciences. This is related to historical events. Profit struggles have caused much suffering in the past for non-privileged people (think about the beginning of industrialisation) and still do so. However, instead of striving for a solution to this problem, these disciplines distance themselves, although they depend on each other. No social work can be done without the appropriate economic power of a country, and no economy can grow permanently without social work, as crime and massive insecurity in such societies and the expenditures for combating this grow. These are massively higher than those of efficient social work (think of the daily rate for imprisonment or for forensic psychiatry) and lead to higher taxes, which can be difficult for entrepreneurship and disturb economic development.

Consequently, the inadequate readiness of economic and social sciences could lead to thematic problems. Economics are focussed on groups of persons with more favourable prognoses and, as in the case of disabled people founding enterprises, they should consider psychological and sociological approaches. The social sciences, on the other hand, ignore the possibility of self-realization of disabled persons through entrepreneurship. A detailed analysis of the problems of disabled entrepreneurs is recommended. The social sciences are weak when it comes to considering the economic science principles assessing integration and self-realization of disabled groups by entrepreneurship. In terms of the economic sciences, being our main perspective, there is a lack of more detailed knowledge which could counter recessions with the help of entrepreneurship by disabled people. For this reason, individual cases must be used for thematic work by means of qualitative methods. The narrative interview forms the most recognized scientific method for research into a field that has so far hardly been considered.

3. Goal and work methodology

By examining personal budget-takers that receive substantial support by legal guardians, we can find out which elements of support are conducive to the independence of people of disabilities and which elements are counterproductive at the

less complex consumer level as compared to the entrepreneurial level. The legal guardians act as consultants for the budget-takers because they must respect the wishes of the people, they are responsible for, and receiving a personal budget happens on a voluntary basis. These results (the role of self-efficiency in creating a well-developed support network, strategies in case of administrative problems, possible discriminations, forms of individual-centre help, ...) can be considered in order to examine entrepreneurship among disadvantaged people and produce evidence, because we can presuppose considerable of similarities, especially concerning application procedures, administrative processes and contact with institutions and services.

Beside these aspects, important global changes, expressed in the terms of a VUCA (Volatility, Uncertainty, Complexity and Ambiguity) world and Industry 4.0 as the latest industrial revolution must be considered. These notions are especially important, because they have an important influence on disabled persons possibilities in a positive, but also in a negative way.

Another interesting option for people with disability will be presented in form of the Enterability project (a project supporting people with disability in building their own business) that has the 2015 European Enterprise Award.

In the last part of the paper we will do empirical research to analyze as a first step, experiences with the Personal Budget in the form of narrative interviews. Subsequently we will perform two narrative interviews with one migrant and one refugee, and as the last step we hope to be able to hold an expert interview with an employee of Enterability, in order to use our findings from the interviews before and compare them with the narration of an expert in the field.

The results of this research will certainly lead to conclusions of the core aim of examining entrepreneurship among disabled persons thus generate evidence in order to support and optimize the conditions for the latter to participate in the economy.

Thanks to our research, measures and recommendations will be formulated that explain how entrepreneurship among disabled people could be supported in an efficient way. Furthermore, we expect to collect more data about administrative processes in Germany due to the well-developed assistance structures and problems linked with them.

Thus, the operational question of the research design for the first step is:

What is the decision-making process for or against applying for a personal budget, by considering the background of the individual life story?

The answer to this question should be worked out by using qualitative research methods. Information to the relation between the important self-efficiency concept of a person with disability and the helping network can be expected, so that processes could be find that counteract or support the self-efficiency concept. From those results, preliminary hypothesis can be dressed, and new input questions can be formulated.

4. Overview of the research

Design:

First step

7 autobiographical-narrative, 7 case-historical-narrative as well as 3 professional biographical-narrative interviews with 4 different phases each (decision-making process, decision, application, decision of the payee)

Survey:

- Autobiographical narrative interviews with 7 potential budget takers
- Case-historical-narrative interviews with legal guardians
- Professional biographical-narrative interviews

Processing: Transcription

Evaluation:

1st step: sequence analysis

2nd step: contrastive comparison

3rd step: theoretical sampling

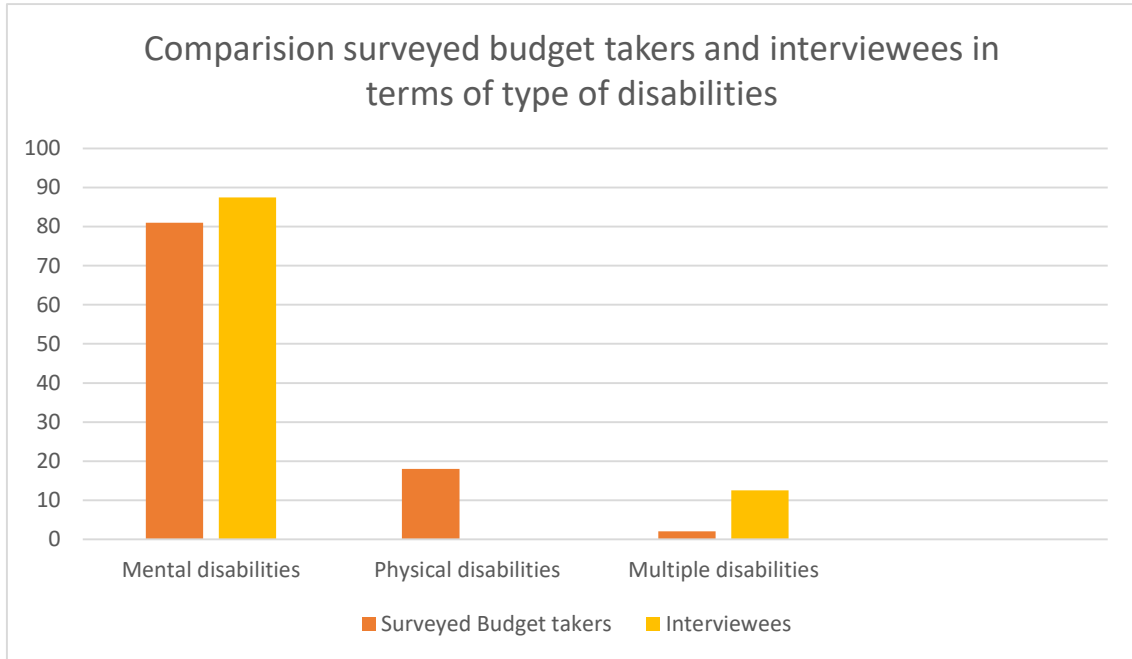
4th step: Perform steps 1 and 2 until theoretical saturation by using interviews.

Primarily hypotheses are articulated

Second step:

Narrative interviews with two disabled entrepreneurs planning their own enterprise or having one already (processing of evaluation as before). We will try to find an entrepreneur with mental disabilities and one with physical ones to compare the entrepreneurship of the latter. Furthermore, we couldn't find an interviewee with exclusively physical disabilities, but went with one with multiple disabilities in our first step (see figure 1 below).

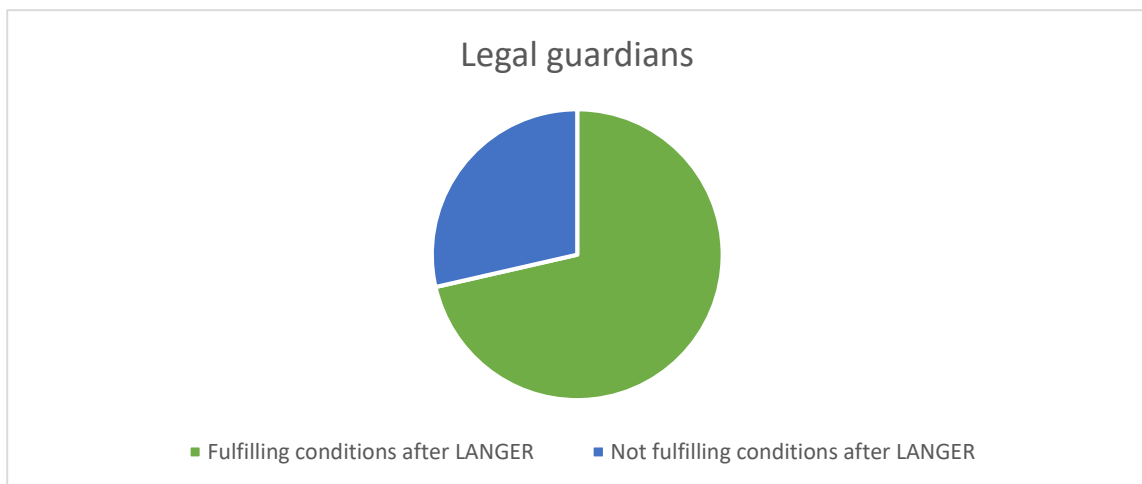
Figure 1:



Budget-takers surveyed (81 % with mental disabilities [intellectual and mental illnesses are included], 18 % with physical disabilities and 2 % with multiple disabilities) (Deutscher Bundestag 2006, p. 11)
Interviewees in our study (87,5 % with mental disabilities (7 interviewees) and 12,5 % with multiple disabilities (1 interviewee))

In this case, though, the multiply-disabled interviewee was the only one who applied for a personal budget by his own initiative compared to the other interviewees where initiative to apply came from their legal guardians (see figure 2).

Figure 2:



5 legal guardians fulfilled important conditions as positive factors of legal guardians to implement a personal budget (experience with the personal budget, professional experience of at least ten years and high number of clients (from 29 clients up) (see LANGER 2011), 2 legal guardians did not.

The evaluation will proceed as described above; resulting hypotheses are compared with new information and adjusted.

Third step:

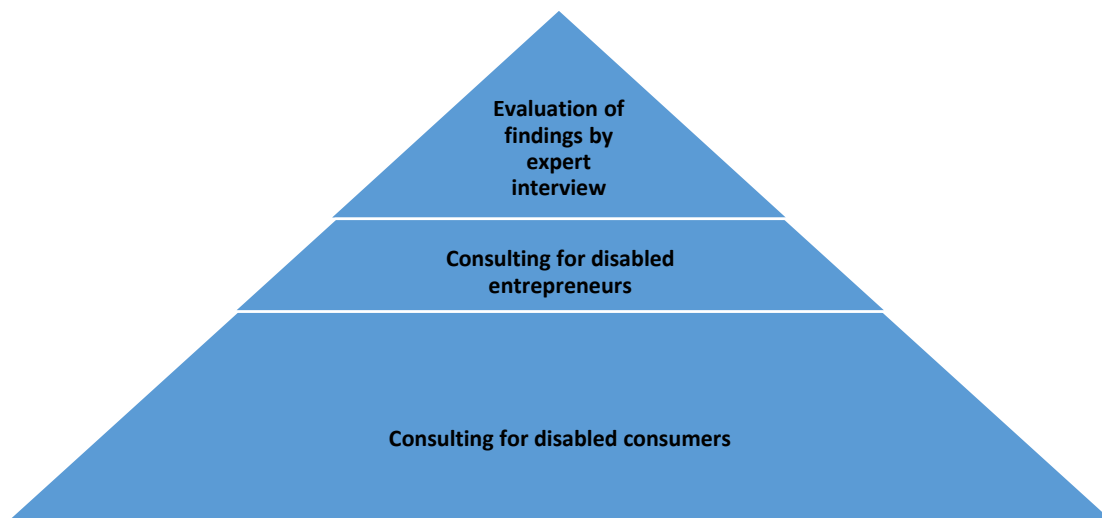
Narrative interview with an expert (employee of the Enterability project) and evaluation as in the first step. Once again, adjustment of earlier hypotheses and final articulation of hypotheses to provide advice to improve services for people with disabilities as consumers and entrepreneurs as well as for their consultants.

5. Summary of the research goals:

1. Recommendations in consulting processes for people with disabilities as consumers
 - Analyze the degree of satisfaction with services offered in the form of a personal budgets (see explanation in the next chapter) and pointing up effective and ineffective interactions of consultants
 - Propound reasons to apply for a personal budget
 - Ways to manage administrative procedures taking place before consumers can benefit from their aid and effectiveness of consultants
 - Influence of administration on consumers' perception of the services and precautions in favour of their relationship to consultants
2. Proposals in consulting for people with disabilities as entrepreneurs
 - Work out reasons to become an entrepreneur
 - Showing entrepreneurship development and contact with the Enterability project (see explanation in the next chapter)
 - Presenting areas of consulting that were required, offered or unavailable
 - Advice for adapting consulting to differences between kinds of disabilities (mental and physical)
 - Guidance for a favourable development of the consulting process and high degree of satisfaction
 - Comparison between consulting for disabled consumers and entrepreneurs and recommendations
3. Evaluation of the findings via expert interview with a consultant from the Enterability project
 - Professional experience and motivation of consultant
 - Examples for successful consulting projects
 - Problems of disabled entrepreneurs and challenges in consulting
 - Discussion of results of research on people with disabilities as consumers and especially as entrepreneurs
4. Summary of the findings and important advices for German institutions and professionals (ministries, consulting enterprises, consultants)

Areas of consulting studied

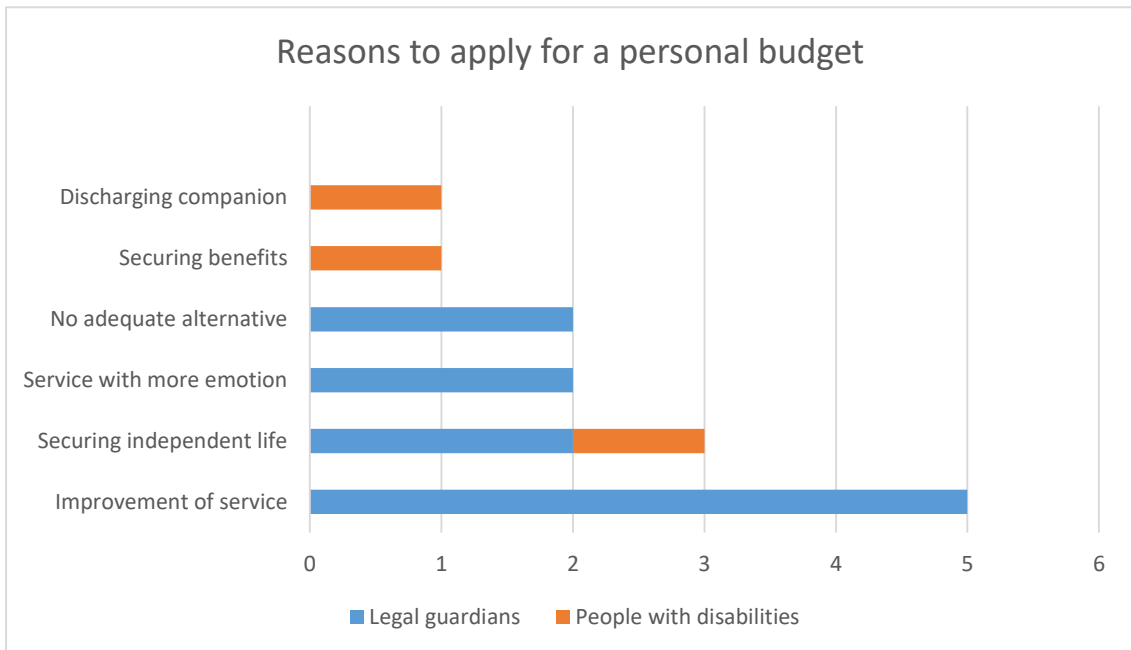
Figure 3:



6. Partial results of the dissertation thesis

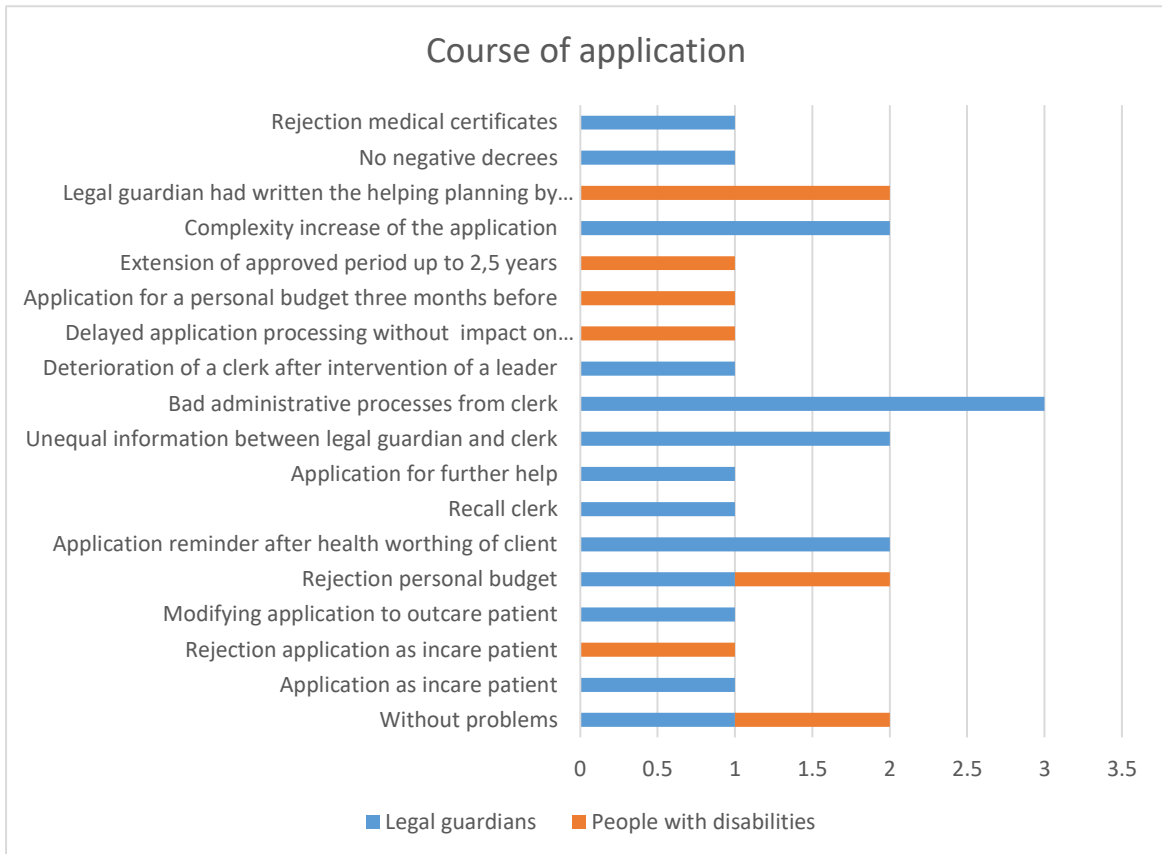
Evaluation of the empirical data clearly shows that, due to individual assistance requirements in the context of personal budgets, problems correspond to individual situations and arise during the implementation of personal budgets and the provision of the assistance setting. In view of the question, the eight cases analyzed also corresponded to eight different types of implementation processes. You cannot find all four phases in any of the personal budgets. The most common phases that could be found in the interviews are phases two, three and four. In only one case phase one could be found. The figures below show important findings of our research:

Figure 4:



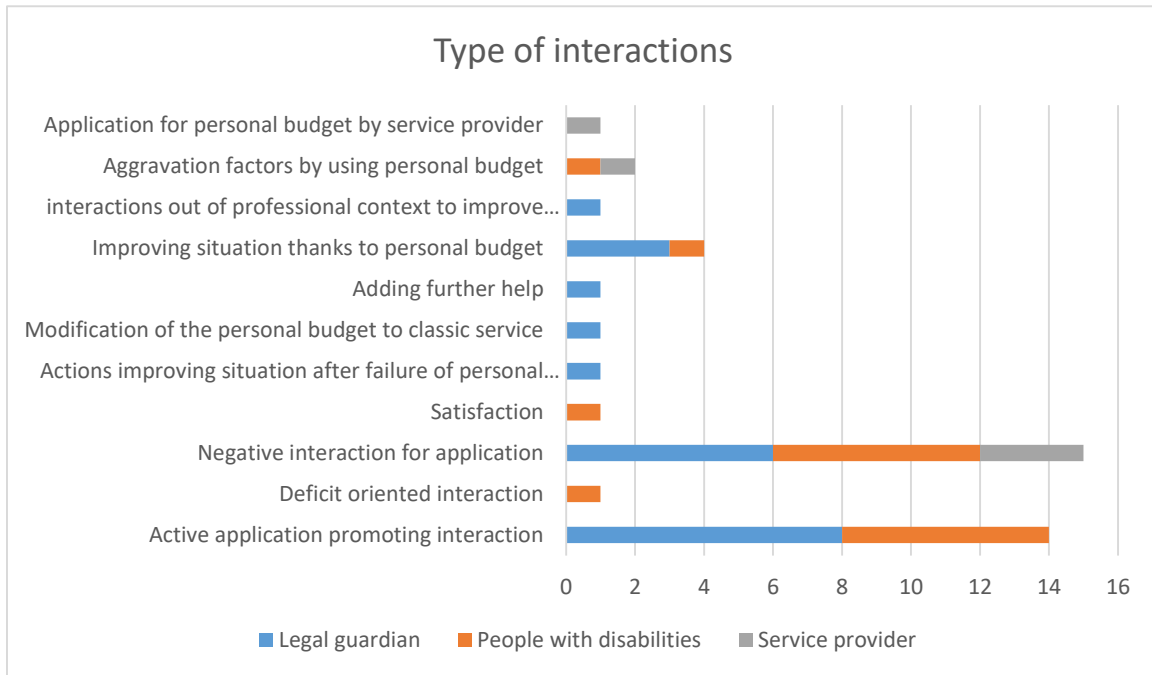
As mentioned above, only one person with disability applied for a personal budget by themselves. The reasons for this were very private. We can assume that he wanted to save his relationship with the help of the personal budget. His multiple disabilities were the consequences of a motorcycle accident. Thus, with this accident his life changed completely, and the personal budget was hoped to compensate this as well as possible in order to save his relationship.

Figure 5:



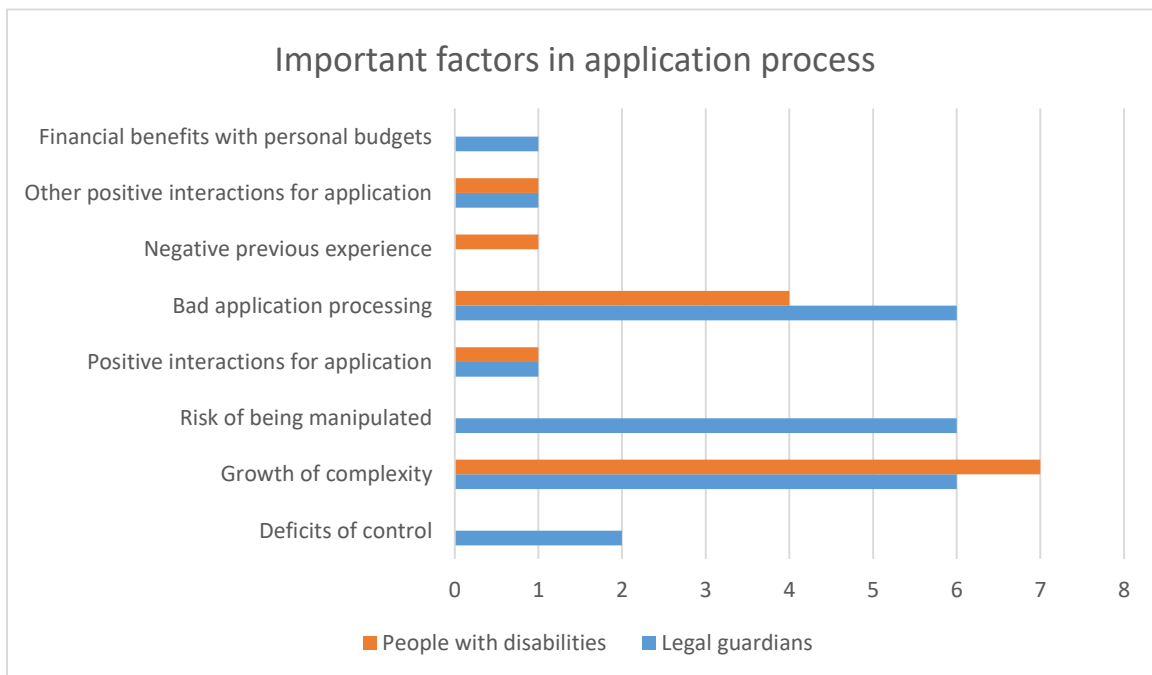
Rejection of medical certificates and writing the assistance plan were unprofessional actions by clerks. Normally, they are under obligation to set out the helping plan. They aren't allowed to refuse medical certificates and must take them into account during the application process. The modification of the application to incare patient wasn't accepted by the person with disability and so led to a further modification to an outcare patient application.

Figure 6:



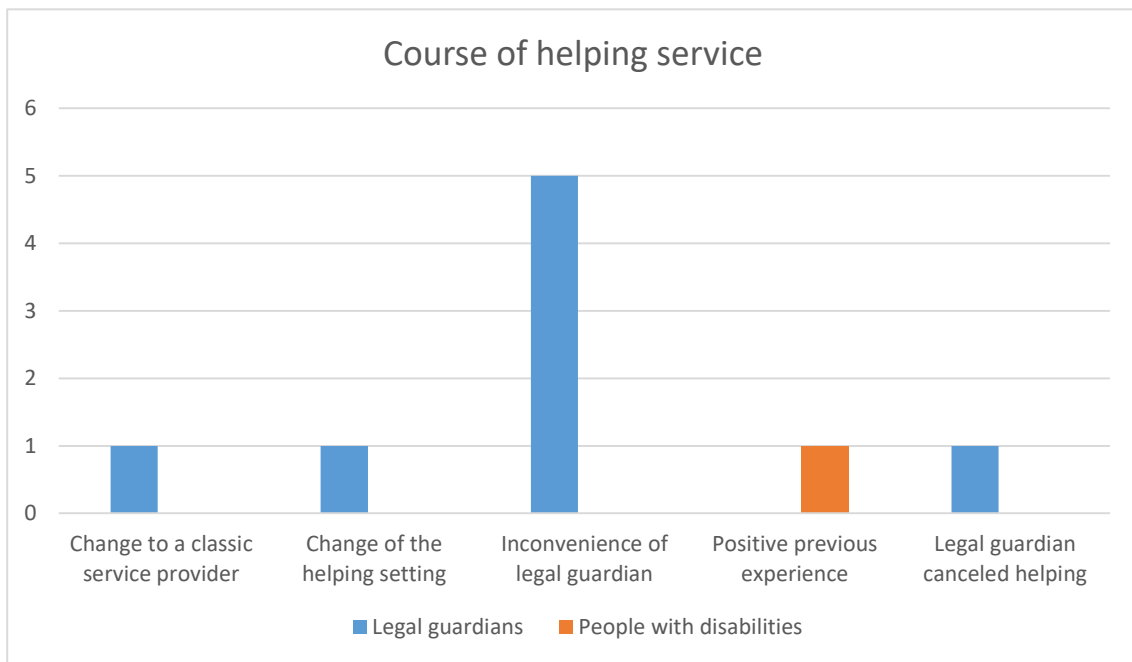
In one case we were able to interview a service provider. The latter had made very bad experiences with the clerks during the application process. Furthermore, we can see that legal guardians put many more actions into execution during the applications than the people with disabilities themselves. This means that chances for them to apply successfully for a personal budget all by themselves are minimal.

Figure 7:



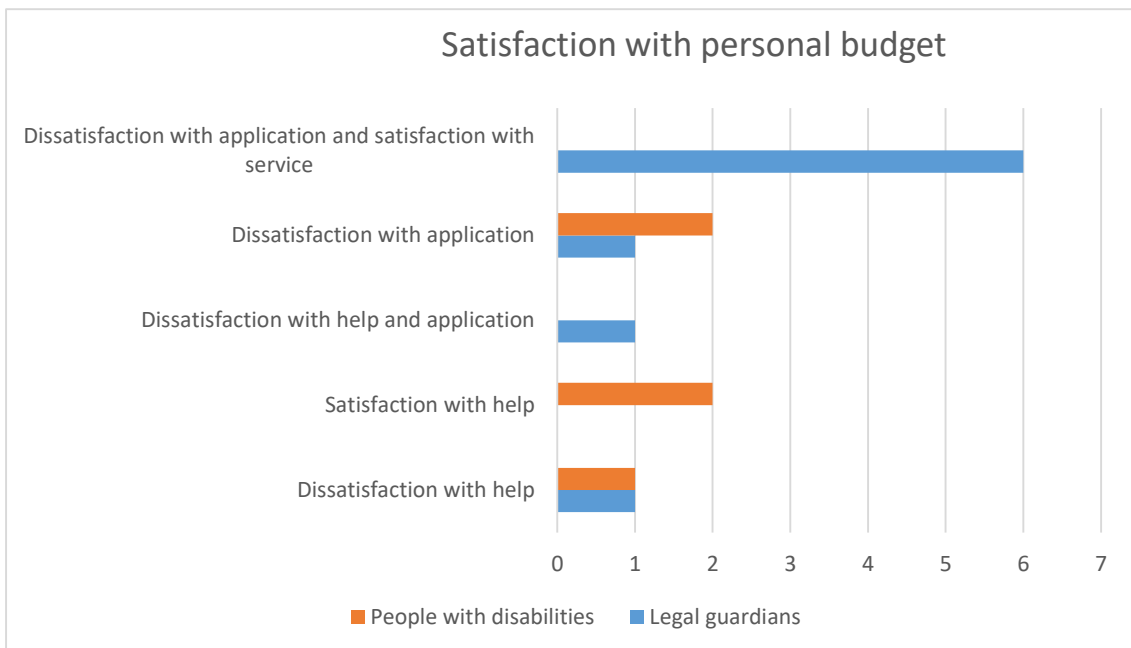
Even though people with disabilities played a more passive role in the application process, they recognize the increase in complexity and the flaws of the application processes. This means that potential budget-takers observe the application process very closely. On the other side, legal guardians risk being manipulated by either their clients or clerks. Supporting an application for a personal budget means a high risk for legal guardians. For this reason, we should not be surprised if most legal guardians don't take the initiative for such an application and demand additional payment for such applications.

Figure 8:



This figure shows that one person with disabilities (GR) has had positive previous experience before. This is why he agreed to apply for a personal budget. His legal guardian had asked him before. In some other cases, though, legal guardians experienced a number of situations giving them inconvenient feelings. This is because the responsibility of the budget-takers rises and so does their legal guardian's because of their legal liability. On the other hand, clerks ask their clients a lot of questions and require documents during the implementation of a personal budget that aren't always easy to deliver because of the different degrees of service quality of various service providers. In the worst case the latter could be a private person without any professional attitude. Because of this, I agree with LANGER in that legal guardians with a network of professional service providers are more willing to tackle an application for a personal budget.

Figure 9:



Most potential budget-takers and legal guardians are satisfied with the service in form of a personal budget. However, they aren't pleased with the application process. Even when legal guardians are the main actors during the application, budget-takers observe the difficulties during the application process. To our purposes, this means that unfavorable frame conditions of the personal budget are equally important to the significant problems this service form has in establishing itself. We can suppose that similarities will be found within the consulting processes of disabled entrepreneurs. If people with disabilities, as consumers, observe processes as shown before and make up their minds, we can be sure that they will do this in a more intense manner if they are entrepreneurs. Thus, transparency in action is certainly one important feature for a consultant who wants to be appreciated by disabled entrepreneurs.

Under the circumstance that in most cases the legal guardians had applied for the personal budget in representation of their clients and so had a well-developed professional attitude, the decision-making process was hard to assess. This means people with disabilities who were interviewed wouldn't be able to be entrepreneurs or would need special support in order to decide in favor of entrepreneurship.

Nevertheless, administrative have an important influence on shortcomings received service. The importance of administrative processes could be pointed out, thus the concept of competitiveness and KLOSTERMANN do. People with disabilities who are unable to take decisions even with support can't be entrepreneurs.

In the case, where institutions have shortcomings in their administrative processes, many unprofessional interactions happen (see the interactions listed in the table in the appendix). Problems in administrative processes are not only the product of

shortcomings but have a political background and can be considered barriers (see table on the case ma4, position of the legal guardian). Complex administrative processes, however can be used by established service providers to create client's dependencies in order to control the market (see remarks to the service provider in case kp or A10). So, the danger of being discriminated felt by disadvantaged people is recovered in administrative processes.

Still, there are also positive examples where administration processes take place without problems, such as in case R9.

The next step is to transfer the results of this research to the next research step, to formulate hypotheses and then go ahead with steps two and three.

7. Resources

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Learning Organization Culture and Core Job Characteristics for Knowledge Workers in Korea

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Abstract

The purpose of this study is to examine the relationship between perceived learning organization culture and core job characteristics in a sample of 264 knowledge workers from four organizations in South Korea. The dimensions of the learning organization questionnaire (DLOQ) and the job diagnostic survey (JDS) were used as measures. The result of a canonical correlation analysis indicated that the composite of learning organization culture (i.e., continuous learning, dialogue and inquiry, team learning, embedded system, empowerment, system connection, and strategic leadership) was modestly but significantly related to the composite of core job characteristics (i.e., variety, identity, significance, autonomy, and feedback), accounting for 34 percent of the shared variance between the two variable sets. More specifically, the effects of dialogue and inquiry, team learning, and system connection in learning organization culture were greater on feedback, autonomy, and task significance in job characteristics for knowledge workers in South Korea.

Keywords: learning organization, job characteristics, canonical correlation, Korea

1 Introduction

The origin of traditional views of organizations was based on the works of Adam Smith (1776) who revolutionized productivity by proposing the concept of *division of labor*, and Max Weber (1922) who suggested the classic conceptualization of *bureaucracy* (Williams and Yang, 1999). But those were the notions when business environment was stable over time. Today, it is a time of change not only in strategy, technology, and product mix, but also in the nature of work and organizational culture. To survive and

thrive in such a world, an organization must always be ready to adapt. The ever changing business environment makes jobs more complex and mobile. Thus, talented employees seek not only salary and benefits, but also more flexibility and autonomy. And smart companies know that flexibility and autonomy might beat out pure compensation especially for knowledge workers (Hall and Heras, 2010).

Since the early *time and motion studies* of Taylor (1911) to the keen interest in motivational aspects of work in the 1970s (Hackman and Oldham, 1975), thousands of studies have examined work design issues (Morgeson and Humphrey, 2006). Work design research is one of the first areas in organizational psychology based on rigorous scientific study, significantly influencing management thinking and practice, as well as academic research and theory (Parker, Morgeson, and Johns, 2017). Work design is regarded as a key antecedent of the major dependent variables in the field of management and organizational psychology: absenteeism, retention, job satisfaction, organizational commitment, job engagement, performance, well-being, creativity, and so on (Parker et al., 2017). Among others, Hackman and Oldham's (1975, 1976, 1980) job characteristics model has been the dominant model of work design, influencing job demand-control, job demand-resources, role theory including job crafting (Parker et al., 2017).

Work design will vary depending on organizational environment, business domain or industry, and job function. We are moving into the world of artificial intelligence, robotics, and other automation technologies (Ford, 2015). While a majority of human jobs might be automated, knowledge workers will survive. Peter Drucker (1988, 1992) long ago pointed to the growth of the knowledge economy and the importance of knowledge workers and foresaw that future organizations would be flatter, information based, and organized around teams in response to competitive challenges. The current study is focused on knowledge workers, which are defined as high-level employees who apply theoretical and analytical knowledge that is acquired through formal education in developing new products or services (Drucker, 1992).

In this increasingly competitive environment in which rapid changes in technologies, markets, government regulations and customers give rise to turbulence and uncertainty (Unsworth and Parker, 2003), organizational structure and culture can significantly influence core job characteristics in many ways (Parker et al., 2001). In particular, the competency of learning has been a critical resource to keep valuable heritage, learning new things, solving problems, creating core competences, and to create new opportunities for both individual and organizations (Liao, Chang, and Wu, 2010). Thus, many organizations strive to have culture of learning organization that creates, acquires, and transfers knowledge, and modifies its behavior to reflect new knowledge and insights (Garvin, 1993). A learning organization refers to an organization with the necessary organizational structures and capacities to create an environment that will stimulate knowledge and ultimately financial performance (Watkins and Kim, 2017).

Thus, a learning organization has an enhanced capacity to learn and to transform (Watkins and Marsick, 1993).

2 Problem Statement and Research Purpose

Learning organizational culture and work design are important research areas in management and organizational psychology in general and organization development (OD) in particular. They are frequently used contextual variables for satisfaction, performance, change, innovation and creativity not only for individuals, but also for groups and organizations (Hackman and Oldham, 1975, 1980; Marsick and Watkins, 2003). Learning organization culture can significantly influence work design in many ways. Hall and Heras (2010) defined smart jobs as those that entail a strong developmental network, help create a protean career orientation, introduce new possible selves, and create psychological career success and other positive career outcomes. Thus, smart jobs require smart culture that support learning in individual level as well as organizational level. Despite a number of studies on job characteristics and increasing attention on learning organization, an in-depth analysis on the relationship between the two critical sets of variables has not been conducted. Most respondents in this study were knowledge workers in junior and middle managers with higher level of education.

The purpose of this research is to investigate the relationship between learning organization culture and core job characteristics for knowledge workers in South Korea. The research question is: “What are the relationships between the seven dimensions of organizational learning culture (*i.e.*, continuous learning, dialogue and inquiry, team learning, embedded system, empowerment, system connection, and strategic leadership) and the sub-constructs of core job characteristics (*i.e.*, skill variety, task identity, significance, autonomy, and feedback)?”

3 Theoretical Framework and Research Model

3.1 Learning Organization Culture (LOC)

The concept of the learning organization is an increasing area of interest in the fields of HR/OD, management, and even school systems (Marquardt, 1996, 2002; Wang, Yang, McLean, 2007). Interest in the learning organization as the source of the organizational success and competitive advantage has been a strong focus in these fields since the past decades (Gilley and Maycunich, 2000; Leonard, 1998; Tsang, 1997).

Learning organization is defined as an environment in which organizational learning is structured so that teamwork, collaboration, creativity, and knowledge processes have a collective meaning and value (Confessore and Kops, 1998), and that enables organizations to be responsive and adaptive to the constant inflows of information and resource characteristics of open systems (Senge, 1990). According to Garvin (1993), a learning organization refers to “an organization skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights” (p. 80). Thus, a learning organization can be regarded as an application of

organizational learning and organization development (Garratt, 1990) to have an enhanced capacity to learn and to transform (Watkins and Marsick, 1993).

To illustrate learning organization, the general systems model that views organizations as “capable of operating either in open or closed systems supports these two perspectives of organizational models” (Williams and Yang, 1999, p. 387). Stressing a systems perspective, Senge (1990) depicted learning organizations as places “where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together” (p. 1). Senge’s (1990) concept of systems thinking that integrates other disciplines, focusing on a vision for the future rather than on short-term returns, embodies the goals that today’s organizations must pursue. He also argued that companies need team learning and a shared vision. These concepts can be attained only with a shift of mind that departs considerably from the perspective of organizations in the past that relied on fixed, predictable principles. Thus, there seems to be general consensus that being a learning organization is a prerequisite for successful organizational change and performance (Garvin, 1993; Marsick and Watkins, 2003). Watkins and Marsick’s (1997) framework for the learning organization, above, serves as a theoretical base for this study (see Table 1). Although Watkins and Marsick’s comprehensive model employed a cultural perspective of organizational learning in the traditions of Schein (1996) and Argyris and Schön (1996), it emphasized diagnosis over prescription, culture over strategy, and building infrastructure and capacities over one-off events or training programs (Watkins and Kim, 2017).

Table 1: Watkins and Marsick's (1997) Model of the Seven Dimensions of the Learning Organization

Dimension	Definition
Continuous learning	Opportunities for ongoing education and growth are provided; learning is designed into work so that people can learn on the job.
Inquiry and dialogue	The organizational culture supports questioning, feedback, and experimentation; people gain productive reasoning skills to express their views and the capacity to listen and inquire into the views of others.
Team learning	Work is designed to use teams to access different modes of thinking; collaboration is valued by the culture and rewarded; teams are expected to learn by working together.
Embedded system	Necessary systems to share learning are created, maintained, and integrated with work; employees are accessible to these high- and low-technology systems.
Empowerment	People are involved in setting and implementing a shared vision; responsibility is distributed so that people are motivated to learn toward what they are held accountable to do.
System connection	The organization is linked to its communities; people understand the overall environment and use information to adjust work practices; people are helped to see the effect of their work on the entire organization.
Strategic leadership	Leadership uses learning strategically for business results; leaders model, champion, and support learning.

3.2 Core Job Characteristics (CJC)

Work design has long been considered to be an important contributor to employees' individual motivation, attitudes, and creative performance at work (Amabile, 1996; Hackman and Oldham, 1975, 1980; Kanter, 1988; Shalley, Zhou, and Oldham, 2004; West and Farr, 1989). Work design is also recognized as a mediator between other variables and outcomes. Using a big picture perspective on work design research, job characteristics model as the dominant model of work design have influenced other branches of work design research such as job demand-control, job demand-resources, role theory including job crafting (Parker et al., 2017). The current study is focused on the traditional motivational model of CJC, which consist of the five components: skill variety, task identity, task significance, autonomy, and feedback.

Table 2: Hackman and Oldham's (1975) Job Characteristics Model

Dimension	Definition
Skill variety	<ul style="list-style-type: none">▪ Doing different things; using different valued skills, abilities, and talents.▪ The degree to which a job requires a variety of challenging skills and abilities.
Task identity	<ul style="list-style-type: none">▪ Doing a complete job from beginning to end, the whole job rather than bits and pieces.▪ The degree to which a job requires completion of a whole and identifiable piece of work.
Task significance	<ul style="list-style-type: none">▪ The degree of meaningful impact the job has on others; the importance of the job.▪ The degree to which the job has a perceivable impact on the lives of others, either within the organization or the world at large.
Autonomy	<ul style="list-style-type: none">▪ Freedom to do the work as one sees fit; discretion in scheduling, decision-making, and means for accomplishing a job.▪ The degree to which the job gives the worker freedom and independence in scheduling work and determining how the work will be carried out.
Feedback	<ul style="list-style-type: none">▪ Clear and direct information about job outcomes or performance.▪ The degree to which the worker gets information about the effectiveness of his or her efforts, either directly from the work itself or from others.

CJC is defined as the perception of the extent that a job is characterized by high levels of autonomy, feedback, significance, identity, and variety (Hackman and Oldham, 1975, 1980; Oldham and Cummings, 1996), which contribute to intrinsic motivation (Amabile, 1988). A meta-analysis of work design literature concluded that employees working on complex jobs are more satisfied and internally motivated than employees working on jobs that are relatively simple (Fried and Ferris, 1987). When jobs are complex and challenging, individuals are likely to be excited about their work activities and interested in completing these activities in the absence of external constraints (Oldham and Cummings, 1996).

As work becomes more obscure and knowledge based, rather than physical and observable, internal motivation and commitment become increasingly significant in production quality and quantity (Williams and Yang, 1999). This observation is especially true of such knowledge intensive products as innovations and creative performance. When jobs are complex and demanding (i.e., high on challenge, autonomy, and complexity), individuals are more likely to focus all of their attention and efforts on their jobs, making them more persistent and more likely to consider different alternatives, which should result in creative outcomes (Shalley and Gibson, 2004). On the contrary,

simpler and more routine jobs may not motivate employees or allow them the flexibility to try new ways of doing things, to take risks, and potentially to perform creatively. In the same vein, as Ford (1995) warned, when organizations assign people to narrow job responsibilities, reward and promotion based on existing norms and procedures, and direct efforts up and down hierarchies, motivated and creative individuals will be out of place.

3.3 Relationship between LOC and CJC

Work design will vary depending on organizational environment, business domain or industry, and job function. In this increasingly competitive environment “in which frequent changes in technologies, markets, government regulations and customers give rise to turbulence and unpredictability” (Unsworth and Parker, 2003, p. 175), LOC can significantly influence CJC in many ways.

As Drucker (1988) put it, organizations are shifting to information-based organizations, or self-governing units of knowledge specialists. Jobs not only in service and knowledge work, but also in manufacturing are becoming more knowledge-oriented, highlighting the importance of cognitive characteristics of work (Parker, Wall, and Cordery, 2001). By definition, knowledge work is “unpredictable, multidisciplinary, and non-repetitive tasks with evolving, long-term goals which, due to their inherent ambiguity and complexity, require collaborative effort in order to take advantage of multiple viewpoints” (Janz, Colquitt, and Noe, 1997, pp. 882-883). Enriched forms of work design are most appropriate where uncertainty is high (Parker et al., 2001), and autonomy has been identified to be particularly salient for knowledge workers (Janz et al., 1997). That is, an increasingly uncertain environment requires LOC, and knowledge workers prefer complex jobs to simple and routine work (Parker et al., 2001).

Therefore, in jobs that require high levels of knowledge and creativity, job occupants’ work attitudes (i.e., the perception of job characteristics) may vary directly with the level of LOC. That is, attitudes about their jobs should be more favorable when environmental characteristics such that LOC complements the knowledge and creativity requirements of the work (Marsick and Watkins, 2003; Shalley, Gibson, and Blum, 2000).

3.4 Research Model

The proposed research model of this study is depicted in Figure 1. This canonical correlation analysis model represents a multivariate statistical model that facilitates the study of interrelationships between the predictor variables set (i.e., the subscales of LOC) and the criterion variables set (i.e., the subscales of CJC)

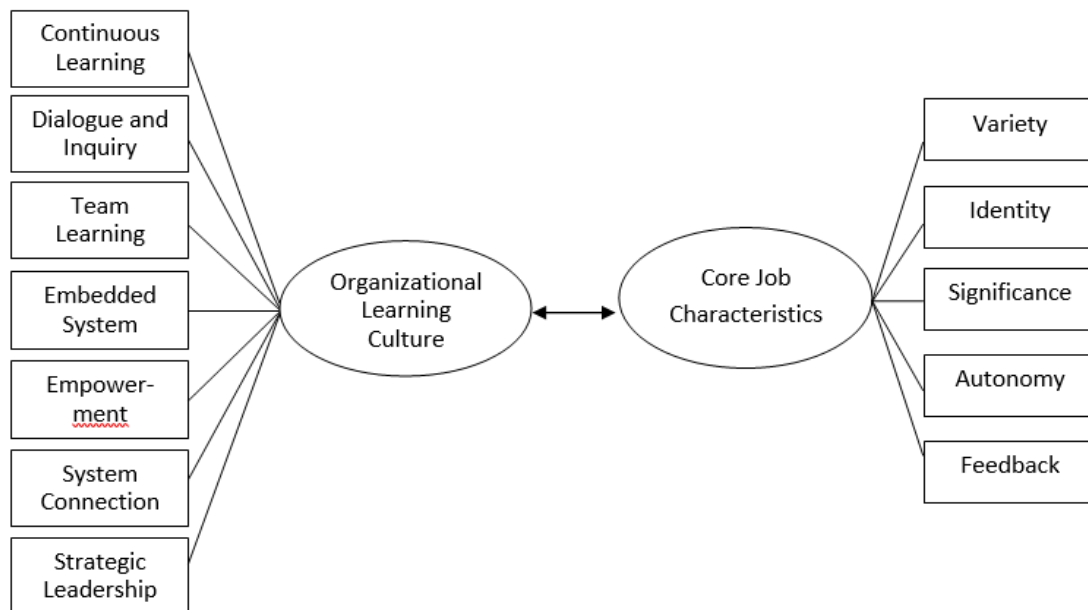


Figure 1: Research Model

4 Method

4.1 Sample and Data Collection

Four Korean companies participated in this study, representing diverse industries: manufacturing, construction, and telecommunications. The HR managers in each company, following the provided guidelines, selected participants who received the email request for participation. A self-administered Internet-based online survey was used to obtain individual perceptions. Of the approximately 600 members contacted through email, responses were received from 264 employees (response rate: 44%). In terms of educational level, 208 employees (79%) graduated from 4 year college, and 56 (21%) from graduate school. While 181 (69%) were manager or assistant manager, 83 represented non-managerial group. Classification by job types were as follows: 54 in marketing and sales (21%), 93 in production, engineering, and research and development (35%), 85 in supporting function such as finance, HR, legal and so on (32%), and 32 in others (12%).

4.2 Measures

All constructs used multi-item scales that have been developed and used in the United States. The instruments were prepared for use in Korea using appropriate translation-back-translation procedures. A 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree) were used.

4.2.1 Learning organizational culture.

To measure the learning organization, this study used Yang, Watkins, and Marsick's (2004) shortened version of the *Dimensions of the Learning Organization Questionnaire* (DLOQ), originally developed by Watkins and Marsick (1997). The instrument uses 21

items composed of seven dimensions (i.e., continuous learning, dialogue and inquiry, team learning, empowerment, embedded system, system connection, and strategic leadership. Yang et al. (2004) provided evidence of construct validity for the refined version of the DLOQ with 21 items and seven dimensions (i.e., three items for each dimension). Sample items included: “In my organization, whenever people state their view, they also ask what others think” and “In my organization, leaders continuously look for opportunities to learn.”

4.2.2 CJC. Fifteen items from the *Job Diagnostic Survey (JDS)* (Hackman and Oldham, 1975, 1980) were used to assess the challenges and complexity of employees' jobs. The instrument was composed of three items for each of the five job characteristics (skill variety, task identity, task significance, autonomy, and feedback). The median alpha of the job characteristics measures in Oldham and Cummings' (1996) study was .68. A sample item was, “the job gives me considerable opportunity for independence and freedom in how I do the work.”

4.3 Analytical Technique: Canonical Correlation Analysis (CCA)

CCA is a multivariate method (Thompson, 1984) that explores the relationship between two variable sets, where each set contains variables that are theoretically linked (Nimon and Reio, 2011). CCA derives a vector of weights that maximizes the correlation between the sets. These coefficients are similar to regression weights in that each standardized coefficient may be interpreted as the independent contribution of that variable to the correlation between two sets (Barcikowski and Stevens, 1975; Lambert and Durand, 1975). CCA is generally considered a more appropriate technique than separately regressing multiple dependent variables on the same set of independent variables. Not only does CCA avoid the inflation of *Type I error* rate associated with conducting several multiple regressions, CCA honors the validity of research that considers multiple outcomes and causes (Thompson, 2000).

In conclusion, it is useful for identifying overall relationships between multiple independent and dependent variables, particularly when the researcher has little a priori knowledge about relationships among the two sets of variables (Hair, Anderson, Tatham, and Black, 1998). In sum, as contrasted in Table 3, CCA statistics are analogous to univariate statistics such as multiple regression analysis (Sherry and Henssen, 2005).

Table 3: Comparison between Univariate and Multivariate Statistics

Multivariate Analysis (CCA)	Univariate Analysis
Canonical correlation coefficient (R_c)	Pearson correlation (r)
Squared canonical correlation (R_c^2)	R^2 in multiple regression
Canonical function (or variate)	Component in a principal component analysis
Standardized canonical function coefficient	Beta (β) weights in regression
Structure coefficient (r_s)	Structure matrix in factor analysis
Squared structure coefficient (r_s^2)	Any r^2 -type effect size

As shown in Figure 1, the two sets of variables were the seven dimensions of LOC (continuous learning, dialogue and inquiry, team learning, embedded system, empowerment, system connection, and strategic leadership) and the five factors of CJC (variety, identity, significance, autonomy, and feedback). CCA results are interpreted using squared canonical correlations (R_c^2), standardized function and structure coefficients as in Sherry and Henson (2005). Interpretation of the canonical variates in a significant function is based on the premise that variables in each set that contribute heavily to shared variances for these functions are considered to be related to each other. Hair et al. (1998) recommended that three criteria be used in conjunction with one another to decide which canonical functions should be interpreted. The three criteria are: (a) level of statistical significance of the function, (b) redundancy measure for the percentage of variance accounted for from the two data sets, and (c) magnitude of the canonical correlation. Those who are unfamiliar with canonical correlation or canonical commonality are respectively referred to Sherry and Henson (2000; 2005) and Nimon and Reio (2011).

5 Results

5.1 Descriptive and Correlation Statistics

Table 4 shows means, standard deviations, and correlations statistics. All correlation coefficients among the sub-scales of the two constructs were positive and significant ($p < .05$) except for one (team learning – variety: .08, n.s.). All correlation coefficients among the sub-constructs of LOC were significant and strong ($r = .55 - .76$; mean = .68). Correlations among the sub-constructs of CJC were significant and moderate ($r = .39 - .65$; mean = .61). With regard to the correlations among the sub-constructs of LOC and CJC, while autonomy and feedback showed modest relationships ($r = .20 - .36$), variety and identity indicated mediocre relationships ($r = .08 - .26$) with the sub-constructs of LOC.

Table 4: Correlations and Descriptive Statistics

	1	2	3	4	5	6	7	8	9	10	11	12
1. Continuous Learning	-											
2. Dialogue & Inquiry	.66**	-										
3. Team Learning	.60**	.72**	-									
4. Embedded System	.74**	.65**	.64**	-								
5. Empowerment	.64**	.68**	.69**	.66**	-							
6. System Connection	.55**	.66**	.69**	.59**	.71**	-						
7. Strategic Leadership	.71**	.70**	.76**	.71**	.67**	.66**	-					
8. Variety	.16**	.19**	.08	.18**	.13*	.17**	.18**	-				
9. Identity	.15**	.19**	.21**	.19**	.24**	.26**	.16**	.39**	-			
10. Significance	.20**	.34**	.30**	.27**	.31**	.37**	.26**	.52**	.55**	-		
11. Autonomy	.25**	.35**	.36**	.29**	.29**	.29**	.31**	.39**	.65**	.57**	-	
12. Feedback	.30**	.25**	.36**	.34**	.34**	.36**	.33**	.44**	.59**	.57**	.62**	-
Mean	3.59	3.79	3.75	3.57	3.69	3.91	3.72	3.93	3.65	4.02	3.60	3.73
s.d.	.64	.57	.60	.63	.55	.54	.64	.71	.69	.72	.68	.68

Note; n = 264; * p < .05, ** < .01.

5.2 Canonical Correlation Analysis Statistics

For the analysis and interpretation of the CCA results, we followed the procedure suggested by Sherry and Hensen (2005): (a) evaluate the full canonical model; (b) decide the number of canonical functions for further analysis, based on a reasonable amount of variance between the two variable sets and the effect size of the dimension reduction analysis; (c) examine the standardized weights and structure coefficients by the function for analysis.

As a result of multivariate test of all canonical functions, this five-function solution turned out to be fitted the data well based on the four tests (see Table 5). More specifically, the full model across all functions was statistically significant using the Wilks's λ = .661 criterion, $F(35, 1,062.50) = 3.135, p < .001$ (see Table 5). Because Wilks's λ represents the variance unexplained by the model, $1 - \lambda$ yields the full model effect size in an r^2 metric. Thus, for the set of five canonical functions, the r^2 type effect size was .339, which indicates that the full model accounted for a substantial portion (34%) of the variance shared between the variable sets. Therefore, there was a significant statistical relationship between the set of independent variables and the set of dependent variables.

Table 5: Statistical Significance Tests for the Full CCA Model

Test Name	Value	Approximate F	Hypothesis DF	Error DF	Significance of F
Pillais's	.379	2.998	35.00	1280.00	.000
Hotelling's	.454	3.246	35.00	1252.00	.000
Wilks's	.661	3.135	35.00	1062.50	.000
Roy's	.224				

A canonical correlation analysis was conducted using the seven LOC variables as predictors of the five job characteristics variables to evaluate the multivariate shared relationship between the two variable sets. The derivation of successive canonical variates is similar to the procedure used with unrotated factor analysis. The first factor extracted accounts for the maximum amount of variance in the set of variables. Then, the second factor is computed so that it accounts for as much as possible of the variance not accounted for by the first factor. This process is repeated until all factors have been extracted. The strength of the relationship between the pairs of variates is reflected by the canonical correlation. When squared (R_c^2), the canonical correlation represents the amount of variance in the predictor variate accounted for by the criterion variate. This also may be called the amount of shared variance between the two canonical variates (Hair et al., 1998).

There are as many functions (or variates) as there are variables in the smaller set (see Table 6). The analysis yielded five functions with squared canonical correlations (R_c^2) of .224, .079, .056, .018, and .002 for each successive function. It is suggested to interpret only the function(s) with a reasonable amount of variance between the variable sets (Sherry and Hensen, 2005). Therefore, we interpreted only function 1 that explained 22.4% of the variance between LOC set and CJC set.

Table 6: Eigenvalues and Canonical Correlations for Each Function

Function	Eigenvalue	Percent (%)	Cumulative Percent (%)	Canonical Correlation (R_c)	Squared Correlation (R_c^2)
1	.288	63.45	63.45	.473	.224
2	.086	19.00	82.44	.282	.079
3	.060	13.12	95.56	.237	.056
4	.019	4.11	99.67	.135	.018
5	.002	0.33	100.00	.038	.002

As indicated in Table 7, the dimension reduction analysis allows the researcher to test the hierarchal arrangement of functions for statistical significance. As noted, the full model (Functions 1 to 5) was statistically significant ($F(35, 1,062.50) = 3.135, p < .001$). Function 2 to 5 was also statistically significant ($F(24, 883.82) = 1.733, p < .05$). Function 3 to 5, Function 4 to 5, and Function 5 to 5 did not explain a statistically significant amount of shared variance between the variable sets respectively. Despite its statistical significance Function 2 to 5 was not interpreted, because it explained only 7.9% of the

remaining variance in the variable sets after the extraction of the prior function (see R_c^2 in Table 6). In sum, given the effects for each function, only the first function was considered noteworthy in the context of this study (22.4% of shared variance).

Table 7: Dimension Reduction Analysis

Roots	Wilks λ	F	Hypoth. DF	Error DF	Significance of F
1 to 5	.661	3.135	35.00	1062.50	.000
2 to 5	.852	1.733	24.00	883.82	.016
3 to 5	.925	1.336	15.00	701.58	.174
4 to 5	.980	.639	8.00	510.00	.744
5 to 5	.999	.128	3.00	256.00	.943

Table 8 presents the standardized canonical function coefficients and structure coefficients for Functions 1. Looking at the structure coefficients (r_s) in Function 1, relevant criterion variables were feedback, significance, and autonomy. This conclusion was supported by the squared structure coefficients (r_s^2). These three job characteristics factors also tended to have the larger canonical function coefficients. Moreover, all of these variables' r_s had the same sign, indicating that they were all positively related.

Regarding the predictor variable set in Function 1, team learning, dialogue and inquiry, system connection, and empowerment were the primary contributors to the predictor synthetic variable. Because the structure coefficients (r_s) had the same sign, they all were positively related to all of the job characteristics factors. These results were generally supportive of the theoretically expected relationships between the two sets of variables.

Table 8: Canonical Solution for LOC Predicting CJC for Function 1

Variable	Standardized Canonical Coefficient	Structure Coefficient (r_s)	Squared Structure Coefficient (r_s^2 ; %)
Criterion set (CJC)			
Variety	.232	-.339	11.49
Identity	.254	-.532	28.30
Significance	-.517	<u>-.807</u>	<u>65.12</u>
Autonomy	-.420	<u>-.798</u>	<u>63.68</u>
Feedback	-.543	<u>-.850</u>	<u>72.25</u>
Canonical Correlation Coefficient (R^2_c)			22.35
Predictor set (LOC)			
Continuous Learning	.185	-.620	38.44
Dialogue & Inquiry	-.391	<u>-.885</u>	<u>78.32</u>
Team Learning	-.410	<u>-.904</u>	<u>81.72</u>
Embedded System	-.219	-.751	56.40
Empowerment	-.046	-.783	<u>61.31</u>
System Connection	-.300	<u>-.849</u>	<u>72.08</u>
Strategic Leadership	.075	-.763	58.22

Note, Structure Coefficient (r_s) greater than |.80| are underlined; Squared Structure Coefficient (r_s^2) greater than 60% are underlined.

6 Discussion

6.1 Research Findings

The purpose of this study is to examine the relationship between perceived LOC and CJC in a sample of 264 knowledge workers from four organizations in South Korea. The result of a CCA indicated that the composite of LOC (i.e., continuous learning, dialogue and inquiry, team learning, embedded system, empowerment, system connection, and strategic leadership) was modestly but significantly related to the composite of CJC (i.e., variety, identity, significance, autonomy, and feedback), accounting for 22 percent of the shared variance between the two variable sets. More specifically, the four dimensions (i.e., dialogue and inquiry, team learning, empowerment, and system connection) of LOC had greater effects on feedback, autonomy, and job significance in job characteristics for knowledge workers in South Korea.

6.2 Theoretical Contributions

This study has several theoretical contributions for the HR/OD field. First, this study integrated learning organization research and work design research, which are the antecedents for critical affective and behavioral employee outcomes (e.g., intrinsic motivation, job satisfaction, engagement, and organizational commitment, individual and organizational performance) and the major intervention approaches for OD efforts.

While CJC can play a pivotal role not only in intrinsic motivation and job satisfaction, but also in performance, more broadly, creativity and innovation, it is contingent on LOC. That is, without such a culture, the efforts invested in job design might be meaningless. Thus, we found that organizations have an incentive to create environments conducive to high-quality relationships by encouraging LOC. Therefore, this study supported previous research: (1) an increasingly uncertain environment requires LOC (Parker et al., 2001); (2) knowledge workers prefer complex jobs to simple and routine work (Janz et al., 1997); (3) enriched forms of work design are most appropriate where uncertainty is high (Parker et al., 2001).

Second, most respondents in this study were highly educated knowledge workers in capital/knowledge intensive industries. Nearly 70% were managers or assistant managers who apply theoretical and analytical knowledge that can be acquired through formal education in developing new products or services (Drucker, 1992). For knowledge workers, organizations need to be open to external environment and community. In addition, culture of free communication (*i.e.*, dialogue and inquiry). Psychological safety will enable better collaboration and team learning. Based on supportive leadership, employees need to be more empowered. It is noted that skill variety and task identity found to be less associated with LOC for knowledge workers, whereas feedback, autonomy, and task significance indicated greater effect size. That is, knowledge workers with complex and flexible work characteristics tend to have already higher level of skill variety and task significance compared to the rest of employees in technical or service jobs.

Lastly, instead of univariate statistical analyses such as multiple regression and ANOVA, we used CCA that is more suitable for a multivariate technique. Most classical parametric analyses are part of a general linear model (GLM) that include univariate and multivariate statistical methods (Sherry and Hensen, 2005). Even structural equation modeling is the highest level of the GLM. In particular, CCA is the most appropriate way to test empirical link between theoretically relevant two sets of variates (Capraro and Capraro, 2001; Nimon and Reio, 2011). Moreover, since most management and organizational psychology research investigates variables that include multiple causes and effects, CCA could be the best statistical approach. Determining outcomes based on separate test for single cases and effects can distort the reality of behavioral and/or attitudinal outcomes in HR/OD. To date, no previous research has examined the relationship between the two sets of variates: LOC as a predictor set and job characteristics as a criterion set LOC and core job complexity.

6.3 Practical implications

HR/OD professionals can support managers by providing relevant practices and services. LOC can significantly influence job characteristics by enhancing all the sub-constructs of LOC, in both people level (*i.e.* continuous learning, dialogue and inquiry, team learning, and empowerment) as well as structural level (embedded system, system connection, and structural leadership) as suggested by Yang et al. (2004). First, the development of an organizational culture that is open and trusting, that allows people to express their views and to listen and inquire into the views of others, and that supports questioning, feedback, and experimentation, is vital for promoting employee's perception of job

complexity. Without such a culture, the efforts invested in work design are sub-optimized. Second, knowledge management systems and social learning, as well as effective communication of vision, values, and goals, can also help to facilitate learning culture at the organizational level. Third, managers can create an organizational culture that promotes systems thinking over fragmentation, collaboration and cooperation over competition, and creativity and innovation over complacency and status-quo.

6.4 Limitations and Recommendations for Future Research

This study has several limitations. First, this study relied on self-reported and reflective recollections of the indicators of the constructs in this study by employees who volunteered their participation. Because of the perceptual nature of the data, there is the possibility of a percept-percept bias and a single source bias. Second, this empirical study confined itself to a cross-sectional survey method that leaves room for speculation with regard to causality among the variables. Next, as the respondents were mostly highly educated male employees, there could be range restriction that might affect the results.

To solve the limitations above, methodologically, future research needs to be based on objective indicators and multiple sources. There should be more longitudinal studies with comparison groups, so that causality can be fully established. To increase generalizability of the present study, more studies in various industries representing diverse demographic cohorts are needed. In addition, more studies are needed in both western and non-western firms. Such research would also help to identify commonalities and differences across cultures. Last, future studies are needed to determine whether job characteristics serve as mediator or moderator role in the relationship of LOC and performance. Additional outcome variables of CJC (e.g., creative performance and proactive behaviors) need to be examined in the future.

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Organizational values and Human Resource Management Factors leading to organizational engagement and sustainability in a local Thai NGO: Case study of Pid Thong Lang Phra Foundation

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Abstract: This study aims to explore the organizational values and human resource management practices that affected employee engagement in a specific organizational context; a Thai CSR-based non-governmental organization (NGO) named Pid Thong Lang Phra Foundation. This exploratory research used a conceptual framework comprised of three variables: 1) organizational values modified from the classic Rokeach (1973)'s theory of values; 2) human resource functions (i.e. recruitment & selection, evaluation & performance management, training & development, and compensation & benefit) and; 3) Hewitt Association (2004)'s organizational engagement. The qualitative research method was adopted in this study. The in-depth interviews were conducted with 9 respondents who worked at Pid Thong Lang Phra Foundation in three different geographical locations; Nan Province, Udonthani Province, and Bangkok. The results revealed that organizational values led to strong organizational culture and sustainable development as the values affect the way people perceive and perform their jobs. In addition, person-organization fit variables displayed in the HRM processes have retained employees in this Thai local NGO.

Keywords: Organizational values, sustainability, employee engagement, human resource management

1. Introduction

Charities and humanitarian organizations have been growing internationally. In Thailand, the Thai government has paid more attention to the non-governmental organizations (NGOs) as a mechanism to promote social, cultural, economic, labor and migration, and environmental activities especially in the remote areas. According to Vadhanasindhu (2002), non-governmental organizations had been developed in Thailand more than a hundred years ago. Essentially, more than 80% of the Thai non-

governmental organizations have focused on the developmental and charitable activities. Generosity and harmonious society are the major values that become the main pillars of non-governmental organization in Thailand (Prateapusanond, 2017).

Nevertheless, the rapidly changing business environment has made sustainable development and employment become the challenges for non-governmental organizations these days. Considering the humanitarian mission of an NGO, it is crucial for the organization to have a systematic implementation of strategic human resource management related activities, policies, and practices that support the performance of the employees as well as that of the organization

This study focuses on a Thai non-governmental organization called “Pid Thong Lang Phra Foundation”. The foundation was first established in 2008 to drive the public learning and development from 4,447 royal projects founded by King Bhumibol Adulyadej. To date, there have been minimal research studies on the role of local Thai NGOs and their discourse and practices (Sthapitanonda & Watson, 2013).

1.1 Research questions

- How organizational values affect the way employees work in a Thai NGO?
- How human resource management practices help with sustainable work and employee engagement?

1.2 Purpose of the Study

This study aims to explore the organizational values and human resource management practices that affected employee engagement in Pid Thong Lang Phra Foundation, the Thai non-governmental organization (NGO) context.

2. Literature review

Based on the research purposes and questions, this literature review focuses on five topics; Non-government organizations in Thailand, Pid Thong Lang Phra Foundation, organizational values, HRM in practices and employee engagement.

2.1 Non-government organizations in Thailand.

Since Thailand has been well-known for its generosity and harmonious society, such values become the main pillars of NGOs in Thailand (Prateapusanond, 2017). According to Vadhanasindhu (2002), NGOs have been coexisting and collaborating with the Thai government as mutual partners. However, Vadhanasindhu (2002) informed that local Thai NGOs mainly perform four common tasks: (a) strengthening the community, (b) educating the public about social issues, (c) providing direct assistance to the minorities, and (d) expanding network and collaboration. This paper presents a Thai NGO namely Pid Thong Lang Phra Foundation which was selected to be a case study. The main objectives and the detail of the Royal Initiative Discovery Foundation will be presented below.

2.2 Pid Thong Lang Phra Foundation.

This Foundation was established by the initiated of His Majesty King Bhumibol Adulyadei who had worked to improve the living standards of Thai people for more than 60 years (Petison, Prapha & Santiprabhob (2016). The objectives were to provide knowledge and skill in rural agriculture in order to create and sustain self-reliance among the poor. The knowledge and technology transfer that had accumulated over the years eventually evolved into the foundation that act as a driving force to propel other royal projects.

The Philosophy of Sufficiency Economy was used to drive the king's projects, covered agriculture, irrigation, forestry, education, health, crop substitution, fisheries, land and road development, watershed development, animal husbandry, environment preservation, and human development. The results were the combined contribution to poverty-alleviation, sustainable development, and preservation of culture and jobs (Padunchewit, 2013). Besides, the promotion of the Philosophy of Sufficiency Economy--with its core principles of moderation, reasonableness, immunity with knowledge and morality -- the King guided and encouraged the involved governmental agencies and bodies working in rural development to adopt his guiding principle under the slogan of "*Understanding-Accessing- Developing*" (the "UAD" approach) as the preferred mode to community development. According to Padunchewit (2013), this UAD approach, which was simultaneously both the foreground and the background of the Pid Thong Lang Phra Foundation, had been kept intact and practiced throughout the variety of development projects under the Pid Thong Lang Phra Foundation major scheme up to now.

2.3 Organizational values. According to Abreu & Camarinha-Matos (2008), the concept of values is multifaceted. There are individual and organizational level (Posner & Schmidt, 1992), occupational, organizational, and national level (Hofstede, 1989), for example. However, Tuulik, Ounapuu, Kuimet and Titov (2016) concluded that in general, the values are interpreted as beliefs, standards, principles and preferences which play an important role in behavior and are influenced by the external environment. Rokeach (1973) indicated that a value once acquired becomes part of an organized system of values; this value system works as a general plan for resolving conflicts and making decisions.

We aimed to explore the organizational values of an NGO Foundation, the organized system of values that may be different from those of other governmental or profit organizations in the country. The following section will elaborate more on human resource management practices in NGOs.

2.4 Human Resource Management in the Non-government Organizations.

Non-government organizations have a different nature from government and profit organizations. These organizations have specific missions and emerged as charities to serve educational, healthcare, and community purpose (Chandler & Johansen, 2012). No matter the different types of organizations, human resource management practices affect individual and organizational performance. The need of having effective human resource management (HRM) and organizational development (OD) is at the heart of sustainable success (Burke & Cooper, 2012).

In general, HRM policies and functions in non-government organizations include recruitment and selection, job orientation, benefits and compensation, performance management, and training and development. Sustainability of the organizations and

engagement of the employees depend upon the effective and system HRM practices. Inadequate HRM practices may cause challenges that affect employee and organizational performance. Hence, HRM has essentially become one of the factors that manipulates the success and failure of the organizations (Batti, 2014). Following are human resource management practices that will be presented as follow.

2.4.1 Recruitment and Selection. Many of the non-government organizations rely on the volunteers, and it is highly important to recruit and place the right volunteers and employees in the right positions (Bryan, Joyce & Weiss, 2006). Not only recruiting the right employees but also retaining the right employees such as internal recruitment which enables growth, career opportunities, and engagement of the employees (Vance, 2006).

2.4.2 Compensation and Benefits. Several research studies indicated that employees working for non-government organizations are paid less than profit organizations (Preston, 1989; Handy & Katz, 1998; Leete, 2001). As compensation plan of the organization have impact on the performance of the employees (Vance, 2006), compensation and benefits must be individualized and employees must be given a freedom of choice to fulfill the needs of a diverse workforce.

2.4.3 Performance Management. The objective of performance management is to enhance the performance of the employees including job satisfaction and commitment as well as the performance of the organizations (Waal, 2001; Smither & London, 2009). Performance management system in the non-governmental organizations are differed from profit organizations due to the value systems. Baruch and Ramalho (2006) explored that non-government organizations highly prioritized and prized soft evaluation criteria in performance measurement. Thus, a systematic performance management must be in place for the betterment of the organization.

2.4.4 Training and Development. Training and development is a primary function of human resource development (Blanchard & Thacker, 2004; McLean, 2012), which provides learning and skills development opportunities to the workforce (Klinger & Nalbandian, 2003). According to Blackmar and Leroux (2012), investment in effective trainings and activities is essential in becoming high performing non-profit organizations and contributing to create a culture of learning, high performers, and organizational success.

2.5 Organizational engagement.

Kahn (1990) firstly introduced the concept of engagement as three psychological conditions as well as people's experiences, namely, meaningfulness, safety and availability. In the later years, engagement has been studied in the form of work engagement, personal engagement, job engagement, staff engagement, employee engagement (Truss, Delbridge, Alfes, Shantz & Soane, 2014). Kahn (1990) also defined, "Personal engagement as the harnessing of organization members' selves to their work roles; in engagement, people employ and express themselves physically, cognitively, and emotionally during role performance" (p. 694). In short, employee engagement shows the degree of employees' involvement and commitment to their jobs and

organizations (Vance, 2006). Hewitt Association (2004) noted that employees who are committed to an organization show three certain kinds of behaviors. These include: (1) Say: the employee speak positively about the organization to coworkers, potential employees, and customers; (2) Stay: the employees have an intense sense of belonging and desire to be part of the organization, and (3) the employee are motivated and exert effort toward success in their job and for the company.

In addition, Cunningham (2012) and Griffin, Philips, & Gully (2015) stated that satisfiable HRM policies and practices can be the drivers of sustainable employee engagement, that bridge the employees and the organizations. Moreover, it can also strengthen the engagement and performance level of the employees and those who engaged with the organization can achieve organizations' mission and generate valuable organizational outcomes (Vance, 2006).

3. Research methodology

This research study employed qualitative method to explore the factors leading to organizational engagement in this local NGO. Creswell (1994) suggested that qualitative study is the process of finding the answers to a problem and to obtain better understanding of complex phenomena. According to Creswell (2007), there are five commonly-used qualitative approaches include narrative, grounded theory, phenomenology, ethnography, and case study. This study opted for the case study method. In order to gain better understanding of case study research, it is essential that the researchers defined case study research as follows.

“Case study research is a heterogeneous activity covering a range of research methods and techniques, a range of coverage (from single case study through carefully matched pairs up to multiple cases), varied levels of analysis (individuals, groups, organizations, organizational fields or social policies), and differing lengths and levels of involvement in organizational functioning” (Hartley, 2004, p.332).

This is in line with Yin (2012) that stated that case study research is the process of inquiry in order to gain greater understanding of the complex situations related to the cases; it is appropriate to apply the case study method as the researchers aim to examine descriptive questions that can assist them to clearly comprehend a social situation. For this study, the researchers focused on “what” values and human resource management factor leading to organizational engagement in a “single” case of Pid Thong Lang Phra Foundation.

3.1 Participant Selection

This study applied purposive sampling for participant selection in this single case approach. The researchers opted for the purposive sampling technique for selecting the participants as this technique is normally designed for small numbers of participants that are particularly informative (Kumar, 2011; Nueman, 2005). While the concept of saturation in qualitative study is widely discussed by many theorists (Charmaz, 2006), this study focused on 9 participants who worked in three different geographical locations in Thailand. This is due to the time limitation and the nature of work in which participants worked dispersedly in many remote areas. The researchers embarked on two long-distance trips to interview 4 people in Nan Province in the north of Thailand

and to interview 1 person in Udonthani Province in the northeast part. We set off a road trip to interview the rest of the respondents in Bangkok and the metropolitan areas.

The major criteria of how respondents were selected was that the participants had to work for the Foundation for at least 3 years in order to understand the organizational values, HR system, and to ensure the respondents engaged to the organization for a certain number of years. Among 9 participants, there were 5 people whose work tenure were 9 years. Each of the rest of the participants worked for 8, 7, 5, and 3 years. All together, there were 6 male and 3 female participants. The participants were selected from 4 different job functions included operational staff (4), consultants (1), managers (2), and supervisors (2). There were 4 participants

The researchers assigned 6-digit coding system to each participant as follows.

1. The first digit: gender (F/M)
2. The second and third digits: job functions
 - ST—Staff, CS –Consultant, MG—Manager, SV Supervisor
3. The fourth and fifth digits: geographical locations
 - BK—Bangkok, NA—Nan Province, UD—Udonthani Province
4. The last digit: Work tenure (9/8/7/5/3)

Therefore, a male participant working as a consultant in a subsidiary at Udonthani Province for 3 years was coded as MCSUD3. As such, we have MCSUD3 from Udonthani; MMGNA8, MSVNA9, FSVNA9, MSTBA9 from Nan and; FMGBK9, MSTBK5, FSTBK5 from Bangkok.

3.2 Instrumentation

According Yin (2012), a case study protocol was developed to implement the research design. The interview questions were developed based on the research questions and verified by three HR professionals in the relevant field for content validity. The major variables and interview questions were categorized into 3 sections as follows.

3.2.1 Work/ personal Values . *Examples of the questions:*

What is the main factor(s) for you to apply for a job in non-governmental organization?
How different are the organizational values/mission compared to your personal values?

3.2.2 Human resource management (i.e., recruitment & selection, training & development,

performance evaluation, compensation & benefits). *Examples of the questions:*

How did you get to know the job vacancy here? What are the major selection criteria?

To what extent have you been satisfied with the compensation and welfare here?

Have you received enough training and the right kind of personal development? What is your career goal?

How do they evaluate your performance here? Do you agree with the results?

3.2.3 Work Engagement (i.e., say, stay, strive). *Examples of the questions:*

If you have a chance to tell other people about the Foundation, what will you tell them about?

What make you stay here? Do you see yourself working here for a longer time?

Do you think the Foundation aims for sustainable development? If yes, how? How do you help the Foundation achieve such objective? Have you enjoy working on it?

4. Findings

The data in this research was acquired through the interview process as well as personal observation. Content analysis method in which the researchers uses frequency by counting the occurrences of words and themes were applied in this study as an initial method to filter the interview data. To accomplish the task, the three-phase procedure of data analysis proposed by Miles and Huberman (1994) was applied. The three-phase procedure included: a) data reduction; b) data display; and c) conclusion drawing and verification. The data were first analyzed using open coding to study the data with the objective of comparing, conceptualizing, and putting the data into categories; data display was then performed to present the findings of the data reduction in the forms of tables, matrices, and quotation to organize the data for the researchers to make conclusions based on the data display and the trustworthiness of the data.

In this study, we described the findings based on our research questions.

Research question#1: What are the common values that help retaining the employees to work at PTLP Foundation sustainably?

It was found that all of the participants had interest in applying to work at PTLP Foundation because they have had their faiths in the King's works especially in the royal projects and therefore wanted to become a part of disseminating knowledge from the royal projects to enhance people's lives. Every respondent mentioned about "*pride*" they received from accomplishing their works and the moment when they witnessed "*happiness*" of poor people particularly those who lived in the rural areas.

I have been impressed with the King's philosophy since I was small. One of his philosophies was to contribute without expectation for any return. I wanted to know if I could do such a thing (MSVNA9).

Isn't it good if we can disseminate knowledge acquired and collected by the King to those who totally need it. If you can help applying the knowledge in other places outside these projects, it would be like to make good imprints you will live with for the rest of your live (MCSUD3)

All of the respondents stated the common work principles they withheld according to the Six-dimension Principle that include the major focus on: 1) soil; 2) water; 3) agricultural crops and plants; 4) alternative energies; 5) forestation and; 6) environment.

Moreover, every respondent reported the working values that created sustainable development that in turn created their personal pride. Obviously, all participants stated that parts of their work were to share the Sufficiency-economy Philosophy established by HM the King in a way that easy to understand. It was utmost important that the employees find ways to stimulate people in a community to find out critical issues, join in the analysis process, and develop solutions for the community's benefits. The common phrase several respondents mentioned about was "*Ra-berd-jak-kang-nai*" or to Burst-from-within concept. In this context, it referred to the ability to help community members discovering the root cause of a problem and having their responsibility and ownership to solve the problem. One of the respondents who worked in Bangkok contended as follows.

It is essential for us to develop KM system by following the Sufficiency-economy Philosophy as a guideline in every branch. However, in practice, we need to find out an area where we can make a prototype—Ra-berd-jak-kang-nai (FMGBK9)

To rely on the “Ra-berd-jak-kang-nai” concept is to keep asking several questions

What will people in the community gain from our work? How will they live sustainably in their land? What crops will they plant, eat, and sell? We have to apply the Sufficiency concept and the Six-dimension guideline differently in different areas across the country. Where to apply the water knowledge or where to apply the forestation knowledge, for example (MSTNA9)

Last, the organizational values that the respondent reported to withhold together was that of the concept “*Kao-jai, Kao-tung, Patana*” or “Understanding, Assessing, Developing”. It is the three-step developmental value that has been imbedded and passed on from generation to generation. One of the respondents stated that:

I’ll give you an easy explanation: to Understand is to gather and understand basic information, social traditions, and agricultural practices within a community; to Reach out is to establish good relationship with the community members; then when you understand and reach out to people it will path the way to create sustainable development (FSVNA9).

We need to essentially gather information and create a developmental model through “*Kao-jao, Kao-tung, Pattana*” according to the need a particular community. With our tools, we are to assist the work of relevant governmental bureaus. Our Foundation was founded by the government to propel the work of our government and work hand-in-hand with them. There are things the authorities up there do not know, not able to access well, and we are here to assist those policy makers (FSTBK7).

For the first research question, three types of values that retain employees: 1) personal values; 2) work values; and 3) organizational values seemed to emerge. All participants mentioned that the personal values they received from their works were the feeling of “pride and happiness”. Such feelings occurred when they achieve their goals in helping the community members to find out the root cause of problems, come up with alternative solutions that emerge from partnerships between PTLP staff and the community members. The developmental model learned from one community was kept, improvised, and applied in other similar areas across the country. The work values that all respondents stated important to them were the Six-dimension Principle (i.e. soil, water, agricultural crops and plants, alternative energies, forestation and, environment), Sufficiency-economy Philosophy, and Ra-berd-jak-kang-nai (Burst- from-within) concept. Last, the organizational values all participants withheld together was Kao-jai, Kao-tung, Patana (Understand, Reach out, Develop).

As for the second research questions: How did the human resource practices help with employee engagement? The questions targeted 4 main areas of human resource management that included: 1) recruitment and selection; 2) evaluation and

performance management; 3) training and development; 4) compensation and benefits. The findings revealed as follows.

As for recruitment and selection process, 6 participants revealed that they were aware of the job opening through recruiting websites. Aside from the job description that was reported precise and clear, these six participants contended that the requirement for volunteering attitude and inspiration for social development were as well essential. A participant who had worked for 9 years share an opinion below.

Those resumes sent via websites would go through a recruiting team that filter them before passing them for a selection call. The team members are usually those who will be that candidate's potential team workers. We selected them because we know what type of people we are looking for. The one who passes will be on probation for 119 days. That's time to prove for the job fit. I myself started here as an intern for three months and I knew it was really a workplace for me (MSTBK9).

Apparently, the major personal attributes vital as the selection criteria are patience, voluntarism and modesty. In addition, the Foundation emphasized on providing opportunity to the underprivileged locals. A participant who worked at Nan Province contended that:

We try not to stick to the old conventional mindset when it comes to selecting people. We want to give opportunity to the local people and many of them have...how can I say...a little dark background...alcoholism, vandalism. They had been through healing and rehabilitating processes and we told them to forget the past and start a new life with us...to help other people (MSTNA9).

Second, the finding revealed detail information regarding evaluation and performance management. It was found that 8 out of 9 participants agreed that, at the Foundation, there were clear working guidelines and evaluation process. The eight participants also stated that, in general, they had been satisfied with the evaluation outcomes. One of the participants from the Bangkok office stated as follows.

I think we have quite good evaluation process even though it started just five years ago. One of the reasons is because our bosses know us all very well. So that they can assess our performance and provide comment on what we should improve. I like that they appraise us for our further development and promotion. But there are not many levels to promote people here. There is also crisscross evaluation with the departments that the works are relevant to ours. This reflects how collaboration had been for the past year (MSTBK9).

The above statement is in line with that of the other respondent who worked at Nan Province. This respondent stated as below.

We are asked to do self-evaluation, then submit it to our immediate boss who proceeds it further. I am happy with how they have appraised me so far. We work with our hearts. I have to say it's hard to find people who work with all their heart to help other people (MMGNA8).

Nevertheless, there was a participant who perceived that the Foundation still lack clarity especially on the appraiser "I know the evaluation criteria. But I never know what and how I should improve myself. I have asked, but never get any feedback" (MSVNA9)

Third, the human resource function mentioned in this study is compensation and benefit. All participants agreed that they were satisfied with the Foundations' compensation and benefit system as this they learned from the first place the amount of salary, welfare, and benefits they would get from their works. Apparently, most of the participants mentioned that they had been inspired by His Majesty the King's work and dedication to the country which inspired them to follow his path.

We don't actually get much salary here, I have to agree. But so far, I am quite satisfied with the welfare package. We have group life and medical insurances. We can reimburse outpatient fee 2,500 Baht per time and dental-care fee up to 3,000 Bath annually. We have had our provident fund accumulated which means we can secure our saving. We can reimburse all work-related expenses for our fieldworks outside the office. We travel by airplane when going out of town. Those who work outside Bangkok get free meals on a daily basis too. I think it's just great (MSTBK9).

I live quite a simple life, so money is not everything for me. What matter is I feel very contented with my work, my co-workers, and the community (MSTNA9) members.

I know that my friends who work in the private sector did not always seem to be happy with their jobs because the money is always tied to their performance evaluations. Their happiness depends very much on the grading and the money...None of us here is going to be rich, but I think we are a happy bunch (MSTBK5).

The forth factor which is the last human-resource finding is training and development. It was discovered that training and development have played an important role in work engagement and also in creating sustainability in the communities. Eight out of nine participants revealed that they had been satisfied with the way training and development was conducted at the Foundation. They thought that having the right training course that could answer to their need and the job demand is vital. One of the female participants made a notice below

We can definitely ask for the skill development that we need by telling our boss. For example, I just applied for a training regarding the communication especially on presentation techniques. But, of course, it

needs to tie to your job—this is what your boss will consider the most (FSTBK7)

In line with the above statement, the participant with a long tenure who worked Bangkok contended as follows.

There are quite a number of training courses we can choose. An employee can consult directly with the boss for sending him or her to a training program. Here at our foundation, a line manager function as HR manager too especially in terms of training decision. We have to be quite multi-tasking. For my work, for example I have to learn the Amadeus program so that we can manage the ticket reservation system. I need to know how to use the Global Positioning System (GPS) on my field work. When I proposed these training programs to my boss with all the reasons, he just immediate approved them (MSTBK9).

Nevertheless, there was one participant who thought there had been less training programs provided, especially for those who worked outside the office. A respondent mentioned that “After the (organizational) restructure, there have been less training for the field workers...just on-the-job trainings have been going on” (MSVNA9).

As for engagement and organizational sustainability, the findings revealed three important facets according to the *Say-Stay-Strive model*. First, the “Say” facet was revealed by every participant as all of them had positive and constructive feedback about the Foundation. A participant from Udonthani Province stated as follows.

I am very proud working here. It’s really worthwhile for me. When I worked for a governmental bureau in the city, I never thought of what the villagers really wanted. The work here at the Foundation has really broaden my horizon. The villagers think I am one of them- we have been really bounded. I believe the Foundation will long be sustainable, simply because the mission makes it so. We make people live better, we are will live better (MCSUD3).

Similarly, a participant from Nan province revealed on the “Say” facet below.

We have been helping with the deforestation around here. So, people can have sustainable living. What we see is the environmental change, a drastic change, but it seriously takes time. At the bottom line, it’s all about how to bring the King philosophy down to practice and to do it sustainably. How to inspire the villagers to “plant what they eat and eat what they plant.” We’ve done it quite successfully. I am always feel proud to tell people that I work here (NSTNA9).

As for the “Stay” dimension, there were 7 out of 9 respondents who had planned to stay working for the foundation continuously as most of them mentioned it felt as if the work

were a part of their lives that truly inspiring and kept them moving. Two female employees from Bangkok and one from Nan office stated as follows.

This organization is like my home. It's almost a spiritual thing to work here so, yes, I am not planning to move anywhere else. I have been wanting to follow the path we do and be innovative about it (FMGBK9).

Well...I see myself working here at least for the next five years. The only question is how would the Foundation adapt to the new and upcoming challenges. I think we all need to adapt to change and work for the better (FSTBK5).

I will continue working here, I suppose, until they (the villagers) don't need me here or there is someone where who could replace me (MMGNA8).

However, there were two respondents that mentioned that they would open to other job opportunities that come along "I have been working here for 9 years and still have nothing of my own. I think I may resign shortly in the future to look after my parents' business and my little brother. (FSVNA9).

Last but not least is the "Strive" dimension. Seven from nine participants agreed that they would want to strive and grow older with the Foundation as they believed the organization has come on the right track. The work of the Foundation has serves, to the high extent, their personal goals as to help poor people to live with better and sustainable lives. Again, most of the participants mentioned about the sustainable philosophy—Understanding, Assessing, Developing.

The Foundation has been established to pass on King Rama IX's great knowledge into practice. I have learned to be a better person by helping people not even my own relatives (FSTBK7).

We are on the right track, to create sustainability, not just in terms of environmental concern but in every dimension. First, we just get involve with the well-being of people in our areas. If they live well or better, it means we are doing a good job. Second, it proves the King's sustainability philosophy—Understanding, Assessing, Developing, just works marvelously, though it takes time (FSTBK7).

5. Discussion and conclusion

Based on the study's finding, we can conclude that the personal value of all participants who work at PTLP Foundation are the "pride and happiness". The means to achieve those values are from the faiths in the King's works and the feeling that they had become a part of the King's dedication to the nation. Especially, when they saw the poor people

particularly those who lived in the rural areas are happy from implementing or joining the royal projects; such sensation become the sense of the accomplishment.

Moreover, the King's three-step developmental value "Understanding, Assessing, Developing" was considered the organizational value that has been imbedded and passed on to all members of PTLP Foundation. Such values become the development principle that are holistic in nature. Essentially, the developmental principle integrated social, economic, and environmental elements to achieve sustainable outcomes in the target areas, focusing on the real needs of the community. These results support the Rokeach's terminal and instrument model of values (1973) that a value influence people's attitude, perception, needs, motivation and commitment.

Furthermore, the human resource practices clearly supported the PTLP foundation's mission that focuses on creating shared value and social or community development. The Foundation emphasized on providing opportunity to the underprivileged locals. All participants agree that they were satisfied with the Foundation's recruitment, training and development, performance evaluation, compensation and benefit system. This is in line with what Burke and Cooper (2012) suggested that the need of having effective human resource management (HRM) and organizational development (OD) is at the heart of successful sustainable development and employment sustainability.

Recommendations

Apparently as a single case study, the results of this case cannot generalize to other Thai or international NGOs. It is recommended that this study should be replicated to other NGOs to see whether organizational values and HRM practices influencing employee engagement and sustainability.

Through this case study, we found organizational values and HRM practices were significant constructs that had supported employee engagement and driven organization to achieve its goals sustainably. Our additional recommendation is for the Foundation to consider the succession planning and creating transferability of these valuable values to the new members in the future.

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The Impact of Emotional Intelligence on Turnover Intention through the Mediation of Work-Family Conflict: The Case of Commercial Bankers in Vietnam

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Abstract: The aim of this research is to examine the effect of emotional intelligence on turnover intention, noting the mediating roles of work-family conflict. Survey data collected from 198 employees at commercial banks in Vietnam was analyzed to provide evidence. Results from the partial least squares structural equation modeling (PLS-SEM) using SmartPLS 3.0 program indicated that there was a negative impact of emotional intelligence on employee turnover intention; this was mediated partially through work-family conflict. The main findings of this research provided some empirical implications for commercial banks. It implied that commercial banks should improve the factors of emotional intelligence to reduce employees' turnover intention.

Keywords: emotional intelligence, work-family conflict, employee turnover, commercial banks, Vietnam

1 Introduction

In the recent decades, the concept of employee turnover intention has been further becoming a popular term in various studies on different managerial disciplines; thus, prompting more executives/managers in many different business fields to apply this concept for their employee management (Lee & Chon, 2000; Tett & Meyer, 1993). Lee and Chon (2000) identified job turnover intention as key considered management term for successful careers and business survival at all level in the service industry for the 21st century. Therefore, organizations in the service industry should give a try to improve their people's work-family balance and take advantages of these emotional balance to create beneficial outcomes.

The particular characteristic of a service industry is "the contact and interaction between service providers (employees) and service acceptors (customers)" (Tsaor & Lin, 2004). The main products provided by service organizations are services and the employees who play a role as service providers will provide those services to customers. Employees in the service industry become a part of service products. Thus, the work-

family balance will enhance their suitable emotions in responding customers' expectations that help to form an image of organizations (Kusluvan, 2003). The issue, then, is how service employees manage their emotions effectively and lessen job turnover intention. Most successful service organizations understand their people's feelings and always have the special cares about any issues that may threaten the employees. However, the traditional management provided by hierarchical structure might not be a truthful way to understand subordinates while the tons of workloads are harming human emotions even with the workaholics (Cropanzano, Rupp, & Byrne, 2003). It is critical for organizations to build a working environment of trust, understanding and encouraging (Taylor, 2001).

On the other hand, since joining the WTO (World Trade Organization) in 2007, Vietnam has taken part in a significant economic growth in the latest decade due to the improvement of business environment and the high volume of foreign investments. Along with the achievement in the economy, Vietnamese banking industry has also seen an outstanding enlargement and development in terms of scale and service quality (Leung, 2009). However, the increases in competition and financial innovation led to an extremely rapid expansion which resulted in banking system problems in the past few years. Eventually, the project 254 called "Restructuring credit institutions system 2011-2015" was implemented by the Prime Minister in 2012. Accordingly, the State Bank of Vietnam has pushed banks to merge with the goal of more than halving the number of lenders. In such an unfavorable condition, labors in this sector has experienced a considerable fluctuation with the highest average voluntary turnover rate compared to other service sectors; with the latest figure in 2018 was more than 15% each year (NavigosGroup, 2018). Restructuring the banking sector not only caused the workforce transition among banks but also between banking and non-banking sectors. Accordingly, keeping the intellectual property for organizations is a crucial strategy for maintaining a sustainable development.

With an increasing interest in employee turnover intention, numerous researches have been conducted in predictors of employee turnover intention and they discovered several factors including emotional intelligence and work-life conflict. Among those, emotional intelligence is also one of the key factors which affecting turnover intention (Avey, Luthans, & Jensen, 2009). Prior studies have confirmed that emotional intelligence strongly affects people intend to leave their jobs in different managerial level by causing lack of trust, work-family conflict (O'Boyle et al., 2011). Additionally, things change and people change. People's emotion changes quickly based on the challenges in the workplaces. Therefore, the management of employee emotional change is an issue for both employees and organization in the service industry. Up to now, numerous studies have been conducted about the perceptions of subordinates in terms of emotional intelligence, work-family conflict, and employee turnover intention and their significant mutual relationships in developed countries (Bande et al., 2015; O'Boyle et al., 2011). Very few scholars did the research about this issue in Vietnam where the term of emotional intelligence and turnover intention were not truly considered in management. These studies, however, focused on other contexts of turnover intention and they did not measure the relationships of these concepts in one model. As shown, this problem has not yet resolved. Thus, based on this gap, this research aims for examining the mutual effect of emotional intelligence on work-family

conflict and subsequently exploring its impact on turnover intention of bankers in commercial banks in Vietnam.

2 Literature Review

2.1 Emotional intelligence

The Emotional Intelligence theory of Bar-On was first introduced in 1985 and followed by a series of other subsequent developed versions by Mayer and Salovey (1993), Cooper and Sawaf (1997), Goleman (1998), Schutte et al. (1998), Law, Wong, and Song (2004), Bar-On (2006). Emotional intelligence was found as an important role in both building and maintaining successful social relationships, predicting specific aspects of situations involving social exchange (Reis et al., 2007). When an organization makes its employees to be satisfied with their job, it will, in turn, obtain the commitment from employees. In this situation, emotional intelligence will either foster or hamper this exchange process. Salovey and Mayer (1990) stated that emotional intelligence as “the subset of social intelligence that involves the ability to monitor one’s own and others’ feelings and emotions, to discriminate among them and to use this information to one’s thinking and actions”. Ravichandran, Arasu, and Kumar (2011) defined emotional intelligence as “the ability to recognize, understand, and assess one’s own feelings as well as others and use this knowledge in thought and action”. Additionally, emotional intelligence involves the acknowledgment of emotions being present constantly and the role of emotions in decision-making and behavior (Krishnaveni & Deepa, 2011). With an increase of interest in emotions, emotional intelligence has got a large number of attention among social and organizational researchers. Mayer and Salovey (1993) have established the scope of emotional intelligence into four dimensions including the self-emotions appraisal reflects the ability of a person to understand own emotions and be able to express properly, then apply knowledge of those emotions to create beneficial outcomes; the other emotions appraisal assesses the ability of an individual to observe and understand other’s emotion. A person who has high capability in this dimension will have good observe on other people’s emotions and predict other’s emotional reaction (Davies, Stankov, & Roberts, 1998); the use of emotion evaluates the ability of an individual to access, generate and use his/her emotion to facilitate personal performance. People who rate highly in this ability will able to return rapidly to normal psychological states after suffering depressed or upset; the regulation of emotion mentions the ability of a individual to regulate his/her emotion to achieve an expected outcome and able to remain balanced from psychological distress to solve the problem. Specific to the financial section, a banker with high ability in this area would perform effectively at enhancing customer enthusiasm and reducing customer frustration (Kidwell et al., 2011). Therefore, the need for understanding employee emotional intelligence is strongly considered in this research.

2.2 Turnover Intention

Turnover intention is defined when an individual intent to withdraw their organization (Khan et al., 2014; Tett & Meyer, 1993). It is inevitable that turnover occurs in every organization in which some of the employees are voluntary to leave the organization

while others are discharged by the organization. Turnover was classified into two types of voluntary and involuntary turnover (Dess & Shaw, 2001). First, voluntary turnover happens when employees are not fulfilled with their job and ready to look for another job in another place. And turnover intention is the volunteer intention of employees to have the desire to leave their organization. Second, involuntary turnover happens when employees are fired by their organization. Either voluntary turnover or involuntary turnover creates serious consequences to the organization in today's business world including a number of difficulties on a replacement, recruitment, selection, socialization cost etc. (Khan et al., 2014; Saeed et al., 2014). Turnover intention has been discovered to be one of the best predictors of actual quitting (Griffeth, Hom, & Gaertner, 2000). Employee's turnover intention is the main determination of actual leaving from the job behavior. According to Chiu and Francesco (2003), such turnover intention is an excellent explanation for employee's actual turnover. Turnover intention involves a sequence of the process, thinking of leaving, intentions to search and to leave (Mobley, 1982). Under this research, voluntary turnover was chosen for discussion. First, Krausz et al. (1995) stated that behaviors are often affected by many variables that investigators cannot control them, but those variables can change the results. Second, turnover investigation has indicated that "a person's self-expressed intentions are the best predictor of actual turnover" (Griffeth et al., 2000). Thus, this study employed turnover intention as the dependent variable.

2.3 Work-family conflict

Olorunfemi (2009) stated that family and work are the inseparable two sides of an adult's life. However, Durup (1993) argued that family and work are the two central areas of life. They shape peoples' roles and define their identity. Disruptive events in either arena can have serious consequences for the individual. The mutual dependence between two spheres implies that strains experienced in one setting will also have an effect on experiences in another setting. This process has been conceptualized in terms of "work-family conflict". Greenhaus and Beutell (1985) stated that work-family conflict arises from the "simultaneous pressures from both roles which indicates that the relationship between them is a reciprocal one". Furthermore, Demerouti et al. (2001) propositioned that work-family conflict is a crucial factor that causes a job burnout. This can lead to absenteeism and increased turnover intention (Davidson & Cooper, 1992). Scholars have developed a variety of conceptual frameworks to describe the work-family conflict. Boyar et al. (2003) divided work-family conflict into two types: "work interfere with family (WIF) and family interfere with work (FIW)". Choi and Kim (2012) posited that WIF appears when employees experience at work interfere with their family life. Conversely, FIW occurs when employees spend too much time worrying their family than work (Mihelic & Tekavcic, 2014). This study considers using these two dimensions because researchers have argued that they are more common and closely associated with job satisfaction, exhaustion and job turnover (Bande et al., 2015).

2.4 Hypotheses

2.4.1 Emotional intelligence and turnover intention

Raza et al. (2018) stated that employees' emotional intelligence not only decrease frustration and stress in the workplace but also help others to have less intention to quit. Optimistic emotions are influential from an individual perception as well as indicative of cooperation and fairness within the organization (Webb, 2009). Pessimistic emotions have negative effects on the organization as well as individuals. Those individuals who are upset have difficulty in assessing others' emotions accurately (Ramesar, Koortzen, & Oosthuizen, 2009). Emotional stress results in a lack of confidence, self-esteem, or motivation reflect these limits. Employees tend to focus more on these negative emotions than they do their work and become disconnected physically and mentally, which results in underperformance and high turnover intention (Frost, 2003). Emotional intelligence may be a key component to keep employees engage and understand the emotional reasons of leaving decision. Employees may use their emotional intelligence to better assess and understand the situation. Thus, emotional intelligence is considered a significant factor in predicting turnover intention of employees which leads towards actual turnover (Riaz et al., 2018). Prior researches demonstrated a negative association between emotional intelligence and employees' turnover intention (Firth et al., 2004; Riaz et al., 2018; Wong & Law, 2002). They stated that employees with higher emotional intelligence have very low intentions to quit. Based on the literature it is hypothesized that:

H1: Emotional intelligence has a negative impact on turnover intention of bankers.

2.4.2 Emotional intelligence and work-family conflict

Emotional intelligence and work-family conflict are two of the fundamental importance to service organizations (Lenaghan, Buda, & Eisner, 2007). Both the organization and its employees are responsible for eliminating work-family conflict. Companies have their own policies and procedures to help their staff manage stress, but their employees still burn out. Certainly, individuals hold some responsibilities for regulating their own family balance, but they need organizational support. Organizations need to recognize and adapt employees' work and lives to win employee loyalty (Carmeli, 2003). According to the content of resource theory, Hobfoll (1989) has identified individual differences as resources causing the negative impacts of stressful events on individuals. Individuals who have more personal resources can deal with the loss of other kinds of resources, including resource loss caused by work-family conflict. "Emotional intelligence represents individual differences in the ability and capacity to monitor and recognize one's own and other's emotions and to use this information to regulate one's emotions and actions" (Gao et al., 2013). Concerning the role of individuals, researchers have emphasized emotional intelligence is an essential factor in protecting employees from the beginning of work-family conflict and stress to identify, acknowledge and manage the emotions. Particularly, Suliman and Al-Shaikh (2007) stated that in terms of conflict management, employees with an inflated level of emotional intelligence tended to have effective control with conflict. Indeed, people with high ability of emotional intelligence tended to suffer less work-family conflict (Lenaghan et al., 2007). Accordingly, the following hypothesis is proposed:

H2: Emotional intelligence has a negative impact on work-family conflict of bankers.

2.4.3 Work-family conflict and turnover intention

Over the past years, many researchers have believed that when experiencing work-family conflict, employees have a tendency to quit their job to eliminate the conflict. Employees may leave an organization because of the high stress of being overworked and limited personal time available to spend away from the office (Bilal, Rehman, & Raza, 2010; Kaye & Jordan-Evans, 2005). They do not want to choose between their personal lives and work, and, if they must, they will choose their personal lives. Employees leave when organizational rules are the cause of intolerable family stress and conflicts (Bilal et al., 2010; Kaye & Jordan-Evans, 2005). Greenhaus, Parasuraman, and Collins (2001) proved that being disappointed with family, work and life entails to the thought that withdraws from work. These studies demonstrated that when job-related retention grows too strong in the organization, one of solution that employee can choose is to leave their firm. Allen and Armstrong (2006) suggested that work-family conflict may cause employees to leave their job because the demand of work lead to frustration in the workplace and the strain from work make it difficult to fulfill family duties. Employees left the emotions felt in the workplace at home, as a result, they find it hard to concentrate on tasks. Similarly, some previous researchers examined and found that WFC has a significant effect on TI (Boyar et al., 2003; Khan et al., 2014; Nohe & Sonntag, 2014; Wang, Lee, & Wu, 2017). Based on the foregoing review and previous research, it is hypothesized that:

H3: Work-family conflict has a positive impact on turnover intention of bankers.

2.4.4 The mediating role of work-family conflict

Basically, emotional intelligence is the ability to understand and to regulate own emotions effectively, as well as to apply these abilities to help them achieve desired outcomes (Mayer & Salovey, 1997). Normally, people who have high emotional intelligence tend to have good control over their emotions. They won't let negative emotions affect their life, work, and relationship with others. Rather, they know how to use their knowledge about emotions to enhance their interpersonal skills and to help them make good decisions without being tampered by emotions. Employees with high emotional intelligence may balance well the relationship between work and family, and that's why they have less turnover intention. Previous researches have shown that the relationships between emotional intelligence and work-family conflict (Sergio, Dungca, & Gonzales, 2015; Weinzimmer et al., 2017), emotional intelligence and employees' turnover intention (Akhtar et al., 2017; Riaz et al., 2018; Siddiqui & Hasan, 2013) and work-family conflict and employees' turnover intention (Riaz et al., 2018; Wang et al., 2017) possibly exist. Linking the associations outlined above, the authors argue that there is a likelihood that work-family conflict mediates the relationships between emotional intelligence and turnover intention. Based on the foregoing review and previous research, it is hypothesized that:

H4. Work-family conflict mediates the relationship between emotional intelligence and turnover intention of bankers.

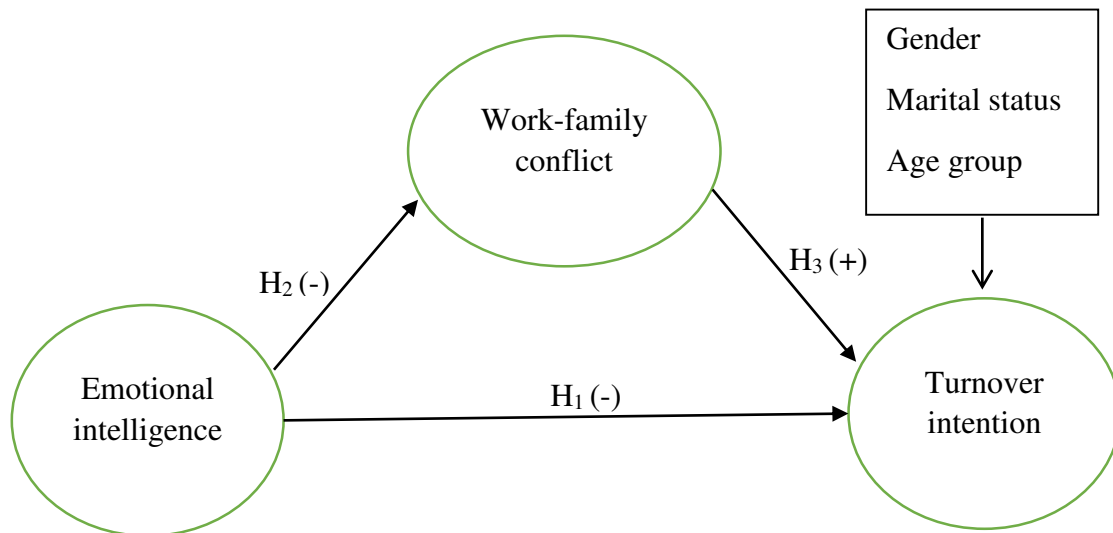


Figure 1: The conceptual model
(Source: authors propose)

3 Research Methodology

3.1 Procedure and sampling size

Respondents were employees who were working at commercial banks in Vietnam. First of all, the authors collected a list of commercial banks in Vietnam. Using convenience method, 35 commercial banks were chosen to do the survey. When a collected bank was listed to do the survey, the authors called to the bank to collect data of the person in charge – human resource manager. We explained clearly about our topic and purpose to do this survey. Totally, there were 10 commercial banks advised the information.

Based on hypothesis and the previous study, draft questionnaires was finished. The draft questionnaire was originally developed in English language, authors translated the questions into the Vietnamese language, and then the authors performed the back-translation with the support of several English language experts.

This study was undertaken through two steps including pilot study (qualitative and quantitative) at the first stage and main survey (quantitative) at the second stage by capturing responses of employees of commercial banks in Vietnam. We contacted 10 employees which we had the relationship to collect the information of employees to do the qualitative pilot study. Taking to correspondents, they were explained the purpose and some definition of the variables to make sure that they could link it to the real job. Then they were asked for a meeting. The authors conducted an in-depth interview with ten employees from three commercial banks by face to face method. The interview was implemented to assess the conceptual model representation, the clarity of words, the

content of the questions and the ability to answer the questions of the interviewees. Consequently, the quantitative pilot study was then used to test the reliability of the scale with a sample of 50 employees selected by convenient method. The purpose of this stage was not only to assure that the instruments employed in this study was appropriate for the context of Vietnam but also to well prepare for the final measurement which was subsequently used in the main survey.

Table 1: Results of the quantitative pilot study analysis of 50 respondents

Factors	Number of items	Cronbach's Alpha	The minimum value of corrected Item-Total Correlation
Self-emotion appraisal	4	0.786	0.500
Others' emotion appraisal	4	0.768	0.475
Use of emotion	4	0.857	0.530
Regulation of emotion	4	0.885	0.697
Family interfere with work	5	0.816	0.536
Work interfere with family	5	0.927	0.725
Turnover intention	4	0.754	0.358

(Source: Analysis results of the authors)

The data was checked its reliability by Cronbach's Alpha coefficient to ensure the internal consistency reliability for item scales. The indicator normally ranged between zero and one and the rates for comparison is that the Cronbach's Alpha index can be acceptable if it is equal or above 0.7 (Hair et al., 2010). In addition, Brzoska and Razum (2010) suggested that the corrected item-total correlation should be more than 0.3. As shown in the figure above (Table 1) indicated that the results of each construct's reliable test with the value of Cronbach's Alpha coefficients of all scales ranging from 0.754 to 0.927 and the minimum value of corrected Item-total correlation coefficients are higher than 0.3. Therefore, the reliability of the scales is sufficiently good and this measurement will be used to test the main survey.

After finished main questionnaires, we designed the questionnaire on Google Docs and hard copy. It had to be easy to read, to stick and sent back to us. The questionnaires were distributed to 10 banks in the chosen sample. About 176 completed questionnaires were collected via Google Docs and 43 questionnaires collected directly. Among these, 21 questionnaires were found invalid due to the fact that the respondents answered one choice for the total questions. Consequently, there were 198 valid feedbacks usable for further data analysis. Table 2 below showed the diverse information about the demographic profile of respondents.

Table 2: Statistics description

N=198		Frequency	Percent
Gender	Female	128	64.6
	Male	70	35.4
Marital status	Single	71	35.9
	Married	127	64.1
Age group	18-25	40	20.2
	26-35	87	43.9
	36-45	62	31.3
	>45	8	4.5
Income	Under 10 million VND	70	35.4
	10-20 million VND	92	46.5
	20-30 million VND	28	14.1
	Above 30 million VND	18	4.0
Education	College/University	157	79.3
	Postgraduate	41	20.7

(Source: Analysis results of the authors)

3.2 Variable measurements

Emotional intelligence scale was measured by 16 items of Wong and Law (2002). Sample items included (Self-emotion appraisal: e.g., “Self-emotion appraisal I have a good sense of why I have certain feelings most of the time”); (Others’ emotion appraisal: e.g., “I always know my friends’ emotions from their behavior”); (Use of emotion: e.g., “I always set goals for myself and then try my best to achieve them”); (Regulation of emotion: e.g., “I am able to control my temper so that I can handle difficulties rationally”). Work-family conflict scale was measured by 10 items of Netemeyer, Boles, and McMurrian (1996). Sample items included (Work interfere with family: e.g., “The amount of time my job takes up makes it difficult to fulfill family responsibilities”); (Family interfere with work: e.g., “I have to put off doing things at work because of demands on my time at home”). Turnover intention scale was measured by 4 items of Vigoda (2000). Sample items included (e.g., “Next year I will probably look for a new job outside this organization”).

3.3 Partial Least Squares Regression

This research employed partial least square-structural equation modeling (PLS-SEM) via SmartPLS program to test model, hypothesis. Lowry and Gaskin (2014a) stated that PLS is an approach which can contribute much utility for causal analysis in behavioral research. In addition to PLS is also a powerful multivariate technique which scrutinizes complex research problems that include unobserved variables, and multifaceted interaction of different variables. PLS has the capability to calculate p-values through a bootstrapping technique if samples are independent and the data doesn’t require to be normally distributed (Kline, 2005). Ringle, Wende, and Will (2005) developed SmartPLS software, which is one of the outstanding applications for PLS-SEM analysis. It is also

well recognized for its ability to work small sample sizes (100-200). Because of all the above strengths, we used SmartPLS 3.0 to analyze data in this research.

4 Research Results and Discussion

4.1 Reliability and Validity of constructs

The reliability of constructs is determined by indicator reliability and internal consistency reliability. According to Wong (2013) defined indicator reliability as the square of the loadings for each indicator. He also recommended that when it is higher than 0.4, the data will satisfy for indicator reliability. As shown in Table 3, almost indicator reliability values were higher than 0.4 except TI4 item (0.269). Thus, this item was deleted due to low indicator reliability values. After, the author removed TI4, indicator reliability was ensured. In addition, internal consistency reliability for all of the latent variables was assessed by using Cronbach's Alpha and composite reliability (CR) (Fornell & Bookstein, 1982). Mitchell and Jolley (2010) posited that a score of at least 0.7 in order to say that a measure is internally consistent. According to Hair et al. (2014) recommended the composite reliability as more suitable to PLS modeling over Cronbach's Alpha. Thus, researchers can use composite reliability to replace for the Cronbach's alpha coefficient. As shown in Table 3 below, the composite reliability score for each of the constructs was greater than 0.7. For, composite reliability score for Family interfere with work = 0.889, Others' emotion appraisal = 0.800, Regulation of emotion = 0.843, Self-emotion appraisal = 0.811, Turnover intention = 0.739, Use of emotion = 0.830, Work interfere with family = 0.882. Therefore, it demonstrated good internal consistency reliability. Also, Dijkstra and Henseler (2015b) stated that the rho_A coefficient is the important reliability measure for the partial least squares. Henseler, Hubona, and Ray (2016) recommended the value of this coefficient should be higher than 0.7. As shown in Table 3, it showed that the value of rho_A coefficients ranging from 0.785 to 0.905. From this evidences, the author can confirm that the reliability of the scales is quite good.

Table 3: Reliability and convergent validity

Construct	Indicator	Indicator loading	Indicator or Reliability (Loadings ²)	Cronbach's Alpha	Composite Reliability (CR)	AVE	Convergent validity CR > AVE AVE > 0.50
Family interfere with work	FIW1	0.787	0.619	0.844	0.889	0.616	Yes
	FIW2	0.807	0.651				
	FIW3	0.813	0.661				
	FIW4	0.724	0.524				
	FIW5	0.790	0.624				
Others' emotion appraisal	OEA1	0.848	0.719	0.800	0.870	0.627	Yes
	OEA2	0.815	0.664				
	OEA3	0.794	0.630				
	OEA4	0.705	0.497				
Regulation of emotion	ROE1	0.766	0.587	0.843	0.895	0.681	Yes
	ROE2	0.833	0.694				
	ROE3	0.815	0.664				
	ROE4	0.882	0.778				
Self-emotion appraisal	SEA1	0.762	0.581	0.811	0.876	0.638	Yes
	SEA2	0.814	0.663				
	SEA3	0.813	0.661				
	SEA4	0.807	0.651				
Turnover intention	TI1	0.812	0.659	0.739	0.833	0.563	Yes
	TI2	0.857	0.734				
	TI3	0.766	0.587				
		TI4	0.519	0.269	This item was deleted due to low indicator reliability values		
Use of emotion	UOE1	0.745	0.555	0.830	0.887	0.664	Yes
	UOE2	0.818	0.669				
	UOE3	0.873	0.762				
	UOE4	0.818	0.669				
Work interfere with family	WIF1	0.855	0.731	0.882	0.914	0.680	Yes
	WIF2	0.853	0.728				
	WIF3	0.851	0.724				
	WIF4	0.802	0.643				
	WIF5	0.759	0.576				

(Source: Analysis results of the authors)

On the other hand, Fornell and Larcker (1981) stated that average variance extracted (AVE) scores should be used to assess the convergent validity of the latent variables. Convergent validity will be confirmed when AVE for each of the constructs is higher than 0.5 (Wong, 2013). As shown in Table 3 above, AVE scores were reported for each of the variables. All variables were higher than 0.5, for, AVE for Family interfere with work = 0.616, Others' emotion appraisal = 0.627, Regulation of emotion = 0.681, Self-emotion appraisal = 0.638, Turnover intention = 0.563, Use of emotion = 0.664, Work interfere with family = 0.680. Thus, each of the constructs indicated good convergent validity.

Discriminant validity indicates the uniqueness or distinctness of a construct when compared to others in the model. According to Ringle, Wende, and Becker (2015) suggested that both Fornell-Larcker criterion (Hair et al., 2014) and Heterotrait-Monotrait Ratio-method (Garson, 2016) should be used to determine the discriminant validity of latent variables. Fornell and Larcker (1981) recommended that discriminant validity is found when the square root of AVE for each of latent variables is higher than other correlation values among any other construct. As shown in Table 4, this analysis shows (in bold) that adequate discriminant validity has been achieved by the square roots of the AVEs that were higher than the off-diagonal correlations. For example, the variable “Self-emotion appraisal” had an AVE of 0.638 (from Table 3 above), and the square root of the cross-loadings for “Self-emotion appraisal” in the Fornell-Larcker Criterion Analysis (Table 4 below) was 0.799. As stipulated 0.799 was both higher than the correlation values in its column (-0.491, 0.455, and -0.370) and its row (-0.442, 0.513, and 0.646).

Table 4: Discriminant Validity (Fornell-Larcker criterion)

	FIW	OEA	ROE	SEA	TI	UOE	WIF
FIW	0.785						
OEA	-0.384	0.792					
ROE	-0.444	0.501	0.825				
SEA	-0.442	0.513	0.646	0.799			
TI	0.554	-0.462	-0.525	-0.491	0.750		
UOE	-0.466	0.425	0.449	0.455	-0.486	0.815	
WIF	0.564	-0.468	-0.465	-0.370	0.510	-0.433	0.825

(Source: Analysis results of the authors)

Henseler et al. (2016) posited that using heterotraitmonotrait ratio of correlations (HTMT) is necessary to confirm discriminant validity for PLS-SEM by “average variance extracted (based on consistent loadings) with its squared consistent construct correlations”. According to Garson (2016) stated that discriminant validity between the two related reflective variables is justified when the HTMT ratio is below than 1.0. Besides, Henseler, Ringle, and Sarstedt (2015) purposed that the HTMT90 should be lower than 0.9. Nonetheless, the stringent heterotraitmonotrait ratio of correlations that are suggested to be satisfied for setting discriminant validity is less than 0.85 for HTMT85 as employed in other researches (Garson, 2016). As shown in Table 5, the values of Heterotrait-Monotrait Ratio of each of constructs were below than 0.80. Therefore, the criteria of discriminant validity were established for HTMT85.

Table 5: Heterotrait-Monotrait Ratio

	FIW	OEA	ROE	SEA	TI	UOE	WIF
FIW							
OEA	0.467						
ROE	0.526	0.607					
SEA	0.531	0.632	0.780				
TI	0.665	0.576	0.648	0.603			
UOE	0.559	0.522	0.535	0.546	0.589		
WIF	0.654	0.555	0.539	0.436	0.599	0.509	

(Source: Analysis results of the authors)

4.2 Assessment of Structural Model

Collinearity assessment is the first step in the structural model analysis. The procedure is necessary to ensure that the path coefficients, which are estimated by regressing endogenous variables on the attached exogenous variables, are not biased. According to Lowry and Gaskin (2014b), collinearity issues exist between respective exogenous variable and the endogenous variable. If the variance inflation factor (VIF) value is greater than 5 or smaller than 0.2 (Wong, 2013), there are collinearity issues with the latent variables. As shown in Table 6, all VIF were below the threshold of 5, the maximum value of VIF was 1.633 (less than 5) and the minimum value was 1.000 (more than 0.2) indicated that the latent variables did not have multicollinearity.

Table 6. Collinearity Statistic

	Emotional intelligence	Work-family conflict
FIW		1.000
OEA	1.000	
ROE	1.000	
SEA	1.000	
TI	1.633	1.633
UOE	1.000	
WIF		1.000
Work-family conflict	1.000	

(Source: Analysis results of the authors)

The structural model path coefficients assessment of the model was carried on by means of the bootstrapping procedure. According to Hair et al. (2014) stated that bootstrapping is a resampling technique to estimate the standard error without relaying in distributional assumptions. Bootstrap result approximates the normality of data. It is used to calculate the significance of the t statistic associated with path coefficients (Wong, 2013). Tables 7 and Figure 2, 3 showed significance values for the path coefficients determined from the bootstrapping process.

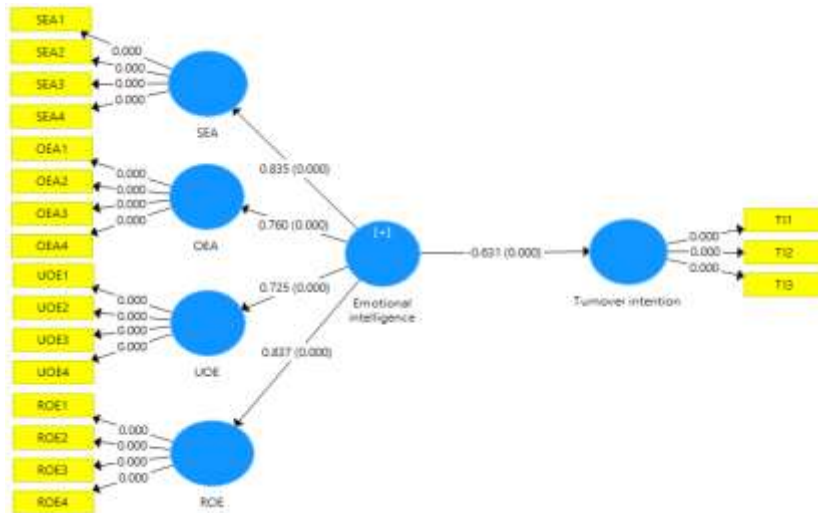


Figure 2: Model 1 – the path coefficient

When we consider significant of the inner model in model 1, it consistent with hypothesis 1. We employed bootstrap to analysis significance of model 1 (Figure 2). The path coefficient is -0.631 which is statistically significant because p-value was 0.000 (less than 0.05). These findings supported hypothesis 1 (Table 7).

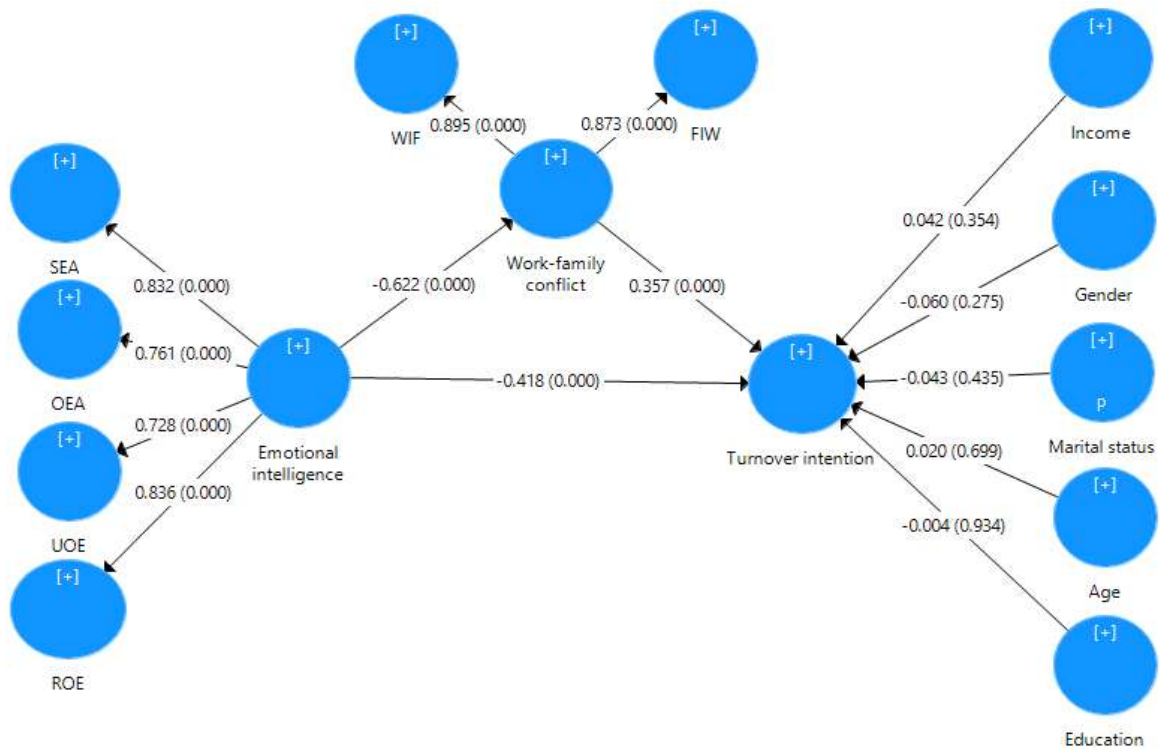


Figure 3: Model 2 – the path coefficient

Table 7. Final results of the relationship checking of model's constructs

Hypothesis	Relationship			Model 1	Model 2	Result
				Regression Weight	Regression Weight	
	EI	→	OEA	0.760***	0.761***	
	EI	→	ROE	0.837***	0.836***	
	EI	→	SEA	0.835***	0.832***	
	EI	→	UOE	0.735***	0.728***	
H ₁	EI	→	TI	-0.631***	-0.418***	Supported
	WFC	→	FIW		0.873***	
	WFC	→	WIF		0.895***	
H ₂	EI	→	WFC		-0.622***	Supported
H ₃	WFC	→	TI		0.357***	Supported
Control variables						
	Gender	→	TI		-0.060 (ns)	
	Age	→	TI		0.020 (ns)	
	Edu	→	TI		-0.004 (ns)	
	Income	→	TI		0.042 (ns)	
	Marital	→	TI		-0.043 (ns)	
Note: ***=p<0.001; ns = not significant						

(Source: Analysis results of the authors)

For hypothesis 1, the results indicated that emotional intelligence had a negatively strong impact on turnover intention with regression weight of -0.418 and p-value = 0.000, which was consistent with the findings of the previous study of Firth et al. (2004), H. W. Lee and Liu (2007), and Riaz et al. (2018). Emotional intelligence was related to bankers who had the propensity to leave his or her job basing on a prolonged period of time being emotionally low regulated by employees' work. Thus, hypothesis 1 was supported.

For hypothesis 2, research result found that emotional intelligence had a negative impact on work-family conflict with a standardized coefficient of -0.622 and p-value = 0.000, corresponds with many studies which suggested that emotional intelligence is one of the preliminary factors preventing employees from establishing of work-family conflict (Suliman & Al-Shaikh, 2007). Subordinate performs good understanding of emotional intelligence would gain feelings of balancing her/his works and family. He or she does not only senses the work being performed is meaningful, but also owns capability to take over the advantages from work-life balance to have mutual results: completing the job successfully and having a happy family (Carmeli, 2003). Moreover, emotional intelligence helps employees figure out work-family conflict and help them

to manage the emotions. In term of conflict management, employees with better emotional intelligence tends to have better effective control with work-family conflict than others. Thus, emotional intelligence (self-emotion appraisal, others' emotion appraisal, use of emotion, regulation of emotion) are important for individual difference effects in regulating emotion in work-family life. Among these factors, emotional intelligence was shown to exert a significant influence on work-family conflict, and as emotional intelligence increased ($\beta = -0.622$), it was shown to have the greatest influence on work-family conflict. Therefore, hypothesis H2 was supported.

For hypothesis 3, in terms of investigating the work-family conflict's relationship with turnover intention, this analysis found a quite strong effect of work-family conflict on employee's job turnover intention with $\beta = 0.357$ and p-value = 0.000. It was connected to the study (Greenhaus et al., 2001). Vietnamese bankers with higher work-family conflict were found to have greater job turnover intentions. With a high regression weight ($\beta = 0.360$), the results showed that conflict from the workplace bringing to employees' home would likely force them to think of leaving their job. Moreover, in the banking sector, the majority of employees are women, may choose to leave an organization voluntarily because of family responsibilities, such as childbearing or child-rearing (Blomme, Tromp, & Rheede, 2010; Griffeth et al., 2000; Meier, Mastracci, & Wilson, 2006; Royalty, 1998). Women are generally regarded as the caretaker for an elderly parent as well (Meier et al., 2006). As the secondary income earner in the household, a woman's income is characterized traditionally as non-crucial income, which is another common reason identified for turnover (Royalty, 1998). Similarly, from a conventional perspective, women require the flexibility or support from an organization to fulfill family responsibilities (Blomme et al., 2010). If these requirements cannot be fulfilled by a firm, the employee is more likely to leave voluntarily. Therefore, H3 was supported.

On the other hand, the findings showed that the component structure of emotional intelligence and work-family conflict were a second-order structure. This result was consistent with emotional intelligence concepts (Wong & Law, 2002), and work-family conflict concepts (Netemeyer et al., 1996), which stated that emotional intelligence was composed of four sub-components: self-emotion appraisal, others' emotion appraisal, use of emotion, regulation of emotion and work-family conflict was composed of two sub-components: work interfere with family, family interfere with work. Regarding dependency level of each variable to their subscales via arrows, the subscales of family interfere with work had the smallest share and work interfere with family had the biggest share in work-family conflict. In addition, the subscales of use of emotion had the smallest share and regulation of emotion had the biggest share in stating the emotional intelligence.

Table 8. The result of mediating effecting

Hypothesis	Relationship	Direct effect	Indirect effect	Total effect	Mediating effect	Result
H4	EI → WFC → TI	-0.418***	-0.222***	-0.640***	Partial Mediation	Supported

Note: ***=p<0.001

(Source: Analysis results of the authors)

The results in Table 7 (model 2) indicated that the values of the p-value for the path EI→TI was 0.000; EI→WFC was 0.000; EI→WFC→TI was 0.000 which were less than 0.05 (Lowry & Gaskin, 2014a). Thus they were statistically significant. After bootstrapping, the path coefficient for path EI→TI was -0.418 (p-value = 0.000), and the value of the p-value for the indirect effect between EI→WFC→TI (Table 8) was 0.000 which was less than 0.05. So, it indicated the mediating role of work-family conflict on the relationship between emotional intelligence and turnover intention. Because the direct effect was lower significant (model 1 = -0.631; model 2 = -0.418 after the mediator enters the model, this type of mediation was partial mediation. Moreover, the total impact for mediation between EI→WFC→TI was -0.640 (p-value = 0.000) which was statistically significant (Gaskin, 2013a). Therefore, hypothesis H4 was supported.

4.3 Control variables

For control variables, as shown in Figure 3 and Table 7, the differences between the mean was not statistically significant because the significance level of control variables such as gender (0.275), age (0.699), Education (0.934), income (0.354), and marital status (0.434) was greater than 0.05, there was not statistically significant on relationship between control variables and turnover intention.

Table 9: Model fit measures

Construct	R Square	Average Variance Extracted (AVE)
UOE	0.530	0.664
OEA	0.579	0.627
ROE	0.700	0.681
SEA	0.693	0.638
FIW	0.762	0.616
WIF	0.802	0.680
Work-family conflict	0.387	0.507
Turnover intention	0.486	0.674

(Source: Analysis results of the authors)

Tenenhaus et al. (2005) and (Wetzels, Odekerken-Schröder, & Van-Oppe, 2009) recommended that the quality of a PLS structural model should be assessed by redundancy, communality, and goodness of fit. This research employed the effect size index (Cohen, 1988), communality and GoF (Tenenhaus et al., 2005) to evaluate the model fit for the structure model. The effect size measures the influence of a specific exogenous latent variable on an endogenous variable when the exogenous variable is eliminated from the model (Hair et al., 2014). (Cohen, 1988) classified effect size into three group including a large effect size at f values above 0.40, a medium effect size at f values ranging from 0.25 to 0.4; a small effect size at f values less than 0.10. According to Wetzels et al. (2009) highlighted Cohen's f index as being equivalent to R² of above 0.26 for a larger effect; ranging from 0.13 to 0.26 for a medium effect, and under 0.02 for a small effect. As shown in Table 9, the R² coefficients of work-family conflict and

turnover intention were 0.378 and 0.486. Both of them were greater than 0.26. Thus, they had a larger effect on the model.

In addition, Wetzels et al. (2009) and Tenenhaus et al. (2005) employed the communality to assess overall validation of the PLS model. They also stated that communality is equivalent to the AVE in PLS model and is supposed an average of 0.5 (Fornell & Larcker, 1981) for good fit. As shown in Figure 3 and Table 9, the structural model indicated an AVE of at least 0.5 for all the endogenous constructs work-family conflict and turnover intention. So, the global structural model of this study proved model-data fit.

For Goodness of Fit index, the goal of GoF is to take into account a unique measure for the global prediction performance of the model (Chin, 2010; Henseler & Sarstedt, 2013). Tenenhaus et al. (2005) theorized that GoF index as the square root of both the average communality (average variance extracted) and the average of R² of the endogenous latent variables. Wetzels et al. (2009) posited the impact of the GoF can be categorized as large effect (GoF = 0.36), medium effect (GoF = 0.25), and small effect (GoF = 0.1). The GoF index for the model of this research was 0.643, which was greater than 0.36. From all evidence above, this study proved that the PLS model was validated globally with a very large effect for the goodness of model-data fit.

5 Conclusions and implications

From the study to examine the effect of emotional intelligence on turnover intention of employees through the mediation of work-family conflict who are working in commercial banks in Vietnam. The final findings strongly supported all the proposed hypotheses. The result showed that emotional intelligence had a negative relationship with turnover intention and work-family conflict and the positive relationship between work-family conflict and job burnout and turnover intention. The respondents in this study who had a high level of work-family conflict will experience a high level of turnover intention. On the other hand, high ability of emotional intelligence could lower level of work-family conflict which later influences to reduce employee retention. In term of emotional intelligence, this article reviewed the definition and dimension of emotional intelligence construct and argued its important role in reducing work-family conflict issue which also decreased the turnover intention. Due to the importance of this issue, it is strongly recommended to promote the development of emotional intelligence and reduce work-family conflict and turnover intention.

Researchers have examined and proved the effect of emotional intelligence in jobs that required high interaction with others such as bankers (O'Boyle et al., 2011). Particularly, this research developed the theory of emotional intelligence by investigating the principal role in decreasing the level of work-family conflict and turnover intention. Keeping positive and motivated staff is a vital factor for commercial banks and has become a pressing matter for the board of directors. When a banker leaves their organization, it must be along with the cost of losing an employee such as the cost of recruiting a new employee consisting of the advertising, interviewing, choosing and hiring, the cost of management activities consist of orientation and training (Mulki & Jaramillo, 2011).

First of all, hiring employees with high levels of emotional intelligence could have a considerable impact on reducing organizational work-family conflict and turnover.

Effective retention strategies often begin during the employee recruitment process (Khan et al., 2014). When choosing the right employee, the manager should strongly consider the personality, temperament, and capacity of candidates. People who are ongoing, passionate and actives will have strong emotion regulation ability. Thus, during the recruitment process, psychological tests and interviews are suggested methods. Psychological assessment usually includes a clinical interview, assessment of intellectual functioning (IQ), personality assessment, and behavioral assessment. Particularly importance with a personality test, it provides interviewer to thoroughly understand a person and their behavior which including temperament, personality, interests, attitudes, values, motivation and other non-cognitive factor characteristics. When interviewing candidates, the interviewer can flexible to extend to various aspects such as education, knowledge, experience, achievement. By these approaches, the employer can properly judge the interviewee and select the qualified staff for the organization. In this ways, the organization hires an employee with high levels of emotional intelligence which further succeed in holding its critical workforce.

Secondly, enhancing training for exciting staff is considered. Since practical training can improve individual emotional intelligence levels. Organizations may consider implementing Employee Assistance Programs (EAPs) to foster banker's emotional competence. EAPs have been formed in United State companies. EPAs are employee benefit programs that provide professional advice and guidance to help staff with personal problems or work-related conflict that have a positive impact on reducing work-family conflict and turnover throughout the enterprise. Managers should develop and utilize EPAs in training employees.

Finally, one of the positive ways to reduce the negative effects associated with work-family conflict and turnover intention is to provide a fair work environment. Fairness is a basic element that human being needs and also a key factor in influencing people's emotions. This will create a pleasant atmosphere, inspire all people in the organization to build up enthusiasm and more positive. Besides, bankers must know clearly what allows to do for their customers and establish realistic expectations regarding performance. Managers should always concern about their people to recognize and assist them to deal with problems effectively. A fair atmosphere is not only beneficial for the employee but employer; if employees are treated well, then they are more likely to treat customers well. Furthermore, employees will retain positive emotions in the workplace, and the level of work-family conflict and turnover intention will reduce.

6 Limitations and recommendations for future research

In this study, there were some limitations as matter. The lack of generalization was the first limitation. A sample size of the project was about 198 which was not generalized to the overall commercial bank and to make the sample more representative, future research should increase the sample size and use probability sampling technique- simple random sampling. Secondly, multi-culture was another limitation in this project. Although the emotional intelligence may be a universal construct, it is believed that characters resulting from the emotional intelligence of individual to an individual may vary across cultures. However, none of the discussion of emotional intelligence across cultural boundaries was mentioned in the literature review. Finally, the survey method

was the only method using in this study. Experimental study and field study should be considered in any future research.

Despite these limitations listed recorded above, the present research had practical implications for managers in the commercial banks. It is expected to expand the literature on turnover intention in the Vietnamese commercial banks, and will motivate further research from this scope. Obtaining actual turnover data is much better than turnover intention since there is still a gap between people who just have the intention to leave and those who ultimately leave their organization. The paper mainly studied the relationship between emotional intelligence, work-family conflict, and turnover intention. There are also other antecedents that predicted turnover, such as job satisfaction, well-being, and employee engagement should be involved in investigating the relationship between emotional intelligence and turnover intention.

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Will robots have the capacity to replace Humankind? Empirical analysis from Portugal

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Abstract

This work aims to study the application of skills and integration of Artificial Intelligence (AI) in Human Resource Management (HRM) and acceptance that this change may have among humans / employees looking to know how they will process this adaptation to this technological change and how can it will come to influence the development of enterprises and society as a whole. It was necessary to use a questionnaire, composed of 30 questions, on the topic under study, which could be answered with 5 levels. In developing this work, a lot of information was collected consisting of studies on the development of artificial intelligence, all of which took for granted, that today, that artificial intelligence is part of our daily lives, finding robots in multiple industries, which help in the development of new scientific knowledge and opportunities in areas such as health, construction of automobiles and no doubt, HR, which will benefit from the introduction of this new technology. There are many ethical and moral issues which must be respected, for instance, you must create boundaries to this technological development, which is AI, and which today no longer receives great resistance from broad sectors of society, and some believe the introduction of AI into companies and other organizations of society will be a factor of development that will create more job opportunities than those that it will inevitably destroy, allowing to bring new knowledge to Man.

Keywords: Artificial Intelligence, Human Resources, Emotions, Technological Advances

1. Introduction

In today's society some very basic questions are posed over the introduction of robots, such as the following: Will robots ever replace humans? Can robots have the ability to produce more and better than humankind? Do robots have the artificial intelligence to develop themselves and be better than humankind? Will HR have the capacity to integrate and adapt the capabilities of the robots together with the collaborators? How much and how fast will robots change societies and organizations?

Accordingly, in this paper we present an empirical study in which we attempted to analyze the perceptions of citizens over these questions, and most of all to this one – May robots replace humankind? In order to address that question, the paper is composed of four parts: literature review, methods and data collection, results and finally, conclusions.

2. Literature review

In this section we present ideas found in the literature about five questions on the relation between robots and humans, namely: robots and HR, robots and HRM, robots and HR development, robots and organizations and robots and society at large. The five

analysis will be presented in succession, from 2.1 to 2.5. In the end (2.6) detailed research proposals will be defined, clarifying the initial research question.

2. Theories

2.1 Artificial Intelligence (AI) in Human Resources (HR)

When talking about the use of AI in HR, it is seen as data that are processed by algorithms, allowing them to be able to make decisions. If we embrace such automation, it is possible to change the day to day processes as well as the way in which Management and Human Resources is done. Robots can also be used in the strategy of making important decisions and in the organization of workers, to study existing labor policies, to make changes that improve the quality of work and to automate some tasks that were exclusive to a worker. With AI, the HR strategy can be modified, and the decisions taken are made with more assertive meaning and better adapted to the qualities of each professional, having a great impact both on the work of the employee and on the results obtained. The more extensive the information is about individual skills and competences, the greater and more realistic the track record of each individual within his / her life in the company will be.

With the use of AI in companies, the manager can quickly have access to valuable information, such as communications, skills, technical work, billing and others, that facilitate the work of those who run the trajectory of a company. According to Crews, in the paper written by Nagele-Piazza (2018), by introducing robots into companies, it is possible to improve wage policies by more easily controlling the various wage levels and professional categories, applying the laws in force in company agreements and eliminating possible errors that exist on the pay grids. According to Parker, it is also possible, as in the Nagele-Piazza (2018) article, to create within the company, Chatbots that allow employees better access to all relevant information in labor relations, facilitating communication between the various departments. The exchange of and use of these technological means must always be accompanied by some prudence, as the use of robots may not be well accepted by employees and may have impacts that cause major changes at all levels within the company.

2.2 Artificial Intelligence (AI) in Human Resource Management (HRM)

Ever since the study of intelligence and human reasoning was a concern of scientists and philosophers, there have been advances made to get to know about this subject which is important to compare and to help in what is now a civilizational advancement with the introduction of AI in the various sectors of activity and in particular in Human Resource Management (HRM). Entrepreneurs are the first stakeholders to promote the introduction of AI in HRM, which will promote major changes in various areas such as recruitment, assessment, training, management and integration.

There is a general consensus that appropriate HRM must involve effective policies and practices that guarantee a good contribution of all the employees in the fulfillment of a company's strategic objectives (Baird, 1988). The performance of the company depends on a set of initiatives and policies implemented by Human Resources, empirical evidences that justify this basic assertion (Harker, 2000). Paradoxically, the studies that established the relationship between Human Resources Management policies and the achievement of company objectives, gave little importance to the difference between the policies and practices that originate in more traditional or technical knowledge and

those that originate from specific policies of strategic management of Human Resources.

In recent years, compensation systems have been involved in conjunction with Human Resources Management policies. It allows identifying factors such as flexible working, improving the quality of work, training and others. Utilization of the companies AI allows adjustments, not only of working hours, but also for employees to have a better lifestyle. Human capital, along with the robots, of a company can be a decisive factor in gaining a competitive advantage (Williams, Ashill, & Naumann, 2015).

2.3 Artificial Intelligence in the Development of Human Resources

Can AI come to steal our jobs? It is a question that is posed today and that puts us on the alert regarding all developments in this matter. According to the historian Yuval Harari (2017), we must devote more of our time to studying and monitoring all the technological advances that AI is having, so that for some years we will not be surprised by the state of integration and interaction between the machines with AI and Humans, which can go beyond the limits of what is ethical and acceptable in society. Only effective early regulation by humans can prevent machines from regenerating themselves and jeopardizing the development of Humanized societies.

Scientist Stephen Hawking (2018) went further and thought that AI will determine the end of the human race. It seems unlikely that this will happen, but this AI technology, is increasingly present in companies and our daily lives, by integrating this intelligence into robots, Iphone, Windows, Facebook and many other tools we use in our daily activities. There are many fully automated call centers, and we will soon see other sectors of activity go the same way toward partial or even total automation. Human Resources is one of the sectors where AI will bring about major changes and its integration will perform the small routine tasks that will allow employees to perform other tasks with greater added value.

Nowadays we already think of complex equipment for companies, with certain cognitive abilities, doing tasks faster than man, and even being able to do more accurate analysis (Moniz, 2018). It is thought that the simplest tasks will be the first to be extinguished. It is believed that with the study done on the future of work, there are some professions that are at risk of disappearing such as; marketing operators, cash operators, cooks, waiters and accountants. (Frey & Osborne, 2017)

The fact that there is an increase in productivity by the machines can lead to greater salary differences among employees, since it is increasingly necessary for specialized individuals with specific skills in one area to monitor several individuals in their respective areas.

2.4 Artificial Intelligence seen in the organization

AI has evolved to such an extent that today it is widely used in many industries such as robotics being an essential tool in automobile assembly lines and other production sectors, as well as in service-related sectors. There has been a constant evolution of robots, companies believe in the added value of introducing machines with AI, robots, which will be a source of development and adding value to all sectors of activity.

AI can be associated with activities that contribute to achieving the goals of companies. Organizations are made up of individuals who have the ability to learn and have a relevant role in the company, who, with the introduction of AI, have their work

redirected towards solving more specific and complex problems while robots handle simpler tasks that can be easily solved with the automation of robots. The emergence of AI has allowed us to develop new tools that can identify inappropriate work behavior. To create technology with AI, which can perceive and correct human behaviors that are less ethical and morally unacceptable, is undoubtedly a great technological advance that can influence and change this type of behavior that is unacceptable in the workplace, specifically sexual harassment. This technological tool, with AI, can be fundamental, in conjunction with HR employees, to eliminate condemnable behaviors that undermine industrial relations in companies.

Humans have limited capabilities to understand and track all developments in the activity of virtual organizations, AI gives virtual organizations the ability to mitigate the limitations of human beings, being able to monitor and control much of the available resources without loss of costly human time. Virtual organizations are the first industrial application of AI, used in the knowledge and development of robotics.

2.5 Artificial Intelligence seen in society

The use of AI can help in various human activities, which are now part of our daily lives. There is an extraordinary volume of data produced and available on computers. AI can provide great aid in the treatment and processing of these data, and this interaction may have benefits for both Human kind and machines.

AI can impact the many daily activities of humans, such as health, environment, space, and many other areas where it is possible to work with AI. There are great potentialities of intervention between Human kind and robots, which together can open space for major investigations, which may in the future solve many of the problems of Human kind. It is possible to think that in the future there is a probability that a doctor will have access to information on cases and treatments of a particular disease, from other patients around the world with similar diseases, to assist in the diagnosis and cure of the disease.

AI is evolving at a speed that Human kind did not anticipate. It is as if a smart, calculating brain, having infinite ability to find patterns and anticipate scenarios that will help fight serious illnesses, have smart cities, and increase the production of many factories. AI will become a virtual company, a voice that goes with us everywhere, this is what happens in countless Gots and virtual assistants, who are coming with countless apps and devices. The great fear that torments man is that AI will become the best friend of many people, which may further increase the existing socialization problems of people today.

Nowadays AI already exists in the houses, cars and many other things that are part of our life. There is an infinite innovative cycle in some popular scientific areas. The use of AI is not, and will never reach a total consensus of being a positive thing, but also there are those who reasonably raise some doubts, particularly related to issues of ethics and morality (Bostrom, 2017). There is a concern with the existence of dangerous intelligent systems, in which anxiety increases with some of the various studies and discussions that are made on this topic.

2.6 Research questions

There are several questions that this study seeks to answer.

Research Question 1: Will AI influence man's way of working, allowing robots to collaborate with human resources without ever replacing them? (Bostrom, 2017)

Research Question 2: Will the interconnection between AI and HRM bring more skills and knowledge, in order to require the best technicians for the organizations? (Luger, Artificial Intelligence, 2004)

Research Question 3: With the introduction of robots in the development of HR, will it be possible for them to develop the simplest tasks, and can man do the most complex tasks? (Hamlin & Stewart, 1998)

Research Question 4: Do organizations see robots as machines that can develop organizations, bring new technologies and that can evolve, also bringing new knowledge and techniques to man? (Wakka, 2018)

Research Question 5: Is AI a positive thing for the evolution of society, supporting what is the development of companies, man and technology? (Oliveira, 2018)

3. Methodologies

3.1 Questionnaire

A questionnaire (see Annex 1) was created, composed of 30 items, six for each one of the research questions defined below (see Table 4). Each item was analyzed with a 5-point Likert scale from Do not agree (1) to Totally agree (5), in which the respondents expressed their level of disagreement or agreement respectively with the problems raised in the survey.

3.2 Data collection

The questionnaire was put in Google, and disseminated with Facebook and LinkedIn, and we obtained about 120 answers: the questions were distributed to another 30 people by mail and 30 more on paper, and thus we obtained a sample of 180 respondents, obtaining concrete answers on this theme.

4. Results

4.1 Sample characteristics

The 180 persons for which we obtained results were mainly women (60 percent), with a bachelor's degree (40 percent) or secondary studies (30 percent). The average age was 46 years, with the extreme ages being between 18 and 88 years old.

4.2 Exploratory factor analysis

Given that the scales we used were new, and untested, we decided to make an exploratory analysis of the information collected.

In consequence some items were eliminated, namely items 1, 4, 10, 14, 18, 19, 21, 22, 23 and 30, because they presented a low factorial weight (<0.50) or because there was saturation in items by more than one factor.

We obtained a new and final structure of factors, composed by 5 factors. After analysis of the items of each factor, the following designations were attributed:

a) Factor 1 is called Impact on the increase of knowledge, being composed by the items: 11. Artificial Intelligence is capable of making important scientific discoveries, and even if we are not able to understand the process, this is considered science.

27. Robots, like man, may have emotions and affections that may be important in more complex situations.

28. Robots will have capabilities that allow you to solve more complex problems, creative ability, critical sense and a lot of individual initiative.

29. The Artificial Intelligence allows one to know the constant needs of the clients, being that such needs are in constant change.

b) Factor 2 is called Effects of robotization in society, resulting from the following items:

5. Robots will be a source of business development and added value to all sectors of business activity and may be of added value to companies.

15. Considers it important, the insertion of Artificial Intelligence, for the labour industry, in the next 10 years.

20. Societies can be intelligent and autonomous enough, taking advantage of what Artificial Intelligence is.

25. Artificial intelligence is increasingly present in companies and in everything man uses.

26. Robotics allows Human Resources Management to be transformed into each company, and there may be a need to have Artificial Intelligence in the company.

c) Factor 3 is considered the impact of the introduction of robots in Human Resources, with the following items:

2. The introduction of Artificial Intelligence will influence how you will manage the Human Resources of a company.

3. Artificial Intelligence can be used in the strategy of making important decisions and organizing workers.

6. If Artificial Intelligence thinks faster than man and can predict which questions are to be answered, it will be able to answer the questions posed.

7. This introduction will modify the various tasks to be performed by Human Resources, being automated by robotics.

8. With automation in Human Resources there are changes in the way of working and areas that can be more developed.

d) The penultimate factor is the Impact on human work, with the following items:

13. Can Artificial Intelligence challenge existing jobs?

24. It is possible for men to feel insecure and threatened by cybernetic risks.

e) Finally factor 5 is called Effect of the interaction between man and robots, the related items being:

9. Humans are always necessary to be able to regulate the presence of the Artificial Intelligence in the company.

12. Bringing companies together with Artificial Intelligence allows you to adjust not only working hours but also allows employees to have a better lifestyle.

16. The integration of Artificial Intelligence may create more jobs than it will destroy, arguing that its use is an opportunity to automate "repetitive and low value added tasks".

17. There must be collaboration between humans and the robots so that together they can achieve the objectives of the company.

4,3 Internal Consistency

The final values for Cronbach's alpha for each item are shown in the following Table. The numbers in bold indicate the factor to which each item belongs. Each item had at least an alpha value of 0.5.

Table 1 - Factorial Weight of the remaining items

Perg.= Question	Factor				
	1	2	3	4	5
Perg._28	,835	,296	,195	,133	,076
Perg._27	,649	,394	,228	,084	,148
Perg._29	,644	,513	,467	,055	,260
Perg._11	,593	,359	,371	,068	,151
Perg._26	,496	,754	,540	,193	,249
Perg._15	,348	,702	,459	-,041	,449
Perg._25	,343	,693	,417	,536	,351
Perg._20	,322	,662	,339	,251	,415
Perg._5	,261	,613	,430	,006	,445
Perg._7	,265	,478	,805	,219	,260
Perg._2	,279	,399	,648	,169	,261
Perg._8	,208	,551	,621	,155	,359
Perg._3	,399	,598	,600	,005	,219
Perg._6	,488	,444	,530	,117	,181
Perg._24	,151	,229	,207	,763	,117
Perg._13	,148	,209	,233	,712	,065
Perg._17	,243	,454	,364	,157	,674
Perg._16	,293	,373	,265	-,264	,563
Perg._9	-,101	,198	,105	,208	,546
Perg._12	,349	,495	,331	-,024	,538

As shown in Table 2 below, the internal consistency for each of the 5 factors revealed a Cronbach's alpha within the limits of acceptability, with values higher than 0.7.

Table 2 – Cronbach Alfa values for the 5 factors defined by the analysis

	<u>Cronbach alfa</u>
<u>Impact on increased knowledge</u>	0,754
<u>Effects of robotization on society</u>	0,807
<u>Impact of introducing robots into Human Resources</u>	0,769
<u>Impact on human work</u>	0,724
<u>Effect of interaction between man and robots</u>	0,648

4.4 Statistical analysis of factors

In order to verify if there is an association between the several factors under study, the respective correlation coefficients were analyzed (see Table 3, below). Based on the consistency levels of the Cronbach alpha, it is possible to verify that among the several items there is a strong correlation.

Table 3 – Main statistical data on the 5 factors

	<u>Average</u>	<u>Standard deviation</u>	1	2	3	4	5
Impact on increased knowledge	2,69	0,89	$\alpha = 0,754$				
Effects of robotization on society	3,53	0,74	0,458**	$\alpha = 0,807$			
Impact of introducing robots into Human Resources	3,56	0,71	0,471**	0,619**	$\alpha = 0,769$		
Impact on human work	4,13	0,93	0,196**	0,277**	0,266**	$\alpha = 0,724$	
Effect of interaction between man and robots	3,59	0,74	0,295**	0,523**	0,381**	0,085	$\alpha = 0,648$

In the table presented, we identify several important values for this study, such as the average, the standard deviation, the Cronbach’s alpha and the correlations between the various items.

Regarding the average values, we find that the affirmations about the impact on the increase of knowledge have an average of 3 (2.69). Therefore, it seems that the individuals who answered were undecided about whether the Increased knowledge for both people and robots could be important for their development and business.

Regarding the other factors, the average of the answers was 4, which indicates that respondents believe that robots can be inserted in society, and can interact with humans, that their introduction in companies can be impacting, and may influence the work environment in the way humans work, being able to help in the accomplishment of tasks, getting humankind and the robots to interact with each other.

With the values presented for the standard deviation, one can perceive the existence of possible values that are out of what is the pattern of given answers, given low values for these factors, it is indicative that AI can have a positive impact, both in the life of humans, and also in the companies, influencing what types of work in the organization and the forms of interaction of the robots, to make the introduction of the robots a reality.

Regarding the existing correlations, although the correlations between the variables will decrease, it is possible to infer a variable based on the knowledge of another variable, the correlations will be strong and significant between the various items, approaching the maximum positive value (1). However, factor 5 when relating to factor 4 presents a value that is not significant, that is, the relation between these two values does not exist. There is a non-linear correlation here, where the various points tend to be concentrated around a curve.

Finally, the alpha of Cronbach is presented, in which each factor has a perfect correlation when correlating with its own factor, being presented the value of this alpha. The fact that all factors present a value higher than 0.7 indicates that the questions presented are valid for the study that is being carried out. The present issues with the associated items will thus be valid for possible future studies.

4.5 Analysis of the answers to the various questions

The answers obtained in the questionnaire regarding the five research questions are summarized in Table 4, below.

Table 4 – Answers to the questionnaire, summary

<u>Factors Under study</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Average</u>	<u>Mode</u>	<u>Median</u>	<u>Standard Deviation</u>	<u>associated answers</u>
<u>Human Resources</u>	1	5	3,83	4	4	0,75	3,8,13,18,23 e 28
<u>Human Resource Management</u>	1	5	3,5	4	4	1,22	2,7,12,17,22 e 27
<u>Development of human resources</u>	1	5	4	4	4	0,89	4,8,14,19,24 e 29
<u>Companies</u>	1	5	3,83	4	4	0,75	5,10,15,20,25 e 30
<u>Organizations</u>	1	5	3,2	3	3	0.41	1,6,11,16,21 e 26

With the presentation of this table, it is verified that there are some differences in the average and the standard deviation between the several existing initial factors, and that also happens a little in the mode and median.

With the results presented, we know that the introduction of AI in the society obtained, in the given answers, an average of acceptance of level 3, which indicates that the respondents do not have an informed opinion on the theme of insertion of AI.

Therefore, it is clear that there are doubts about the benefits of having robots in the daily life of humankind. The answers given for the remaining items, obtained an average degree of acceptance of level 4, which indicates the introduction of AI in organizations and HR, can be beneficial in the future, since it can help humankind in the performance of routine tasks, leaving the collaborators freer to perform other tasks within the development of various areas, making possible the synergistic collaboration between robots and human kind.

Analyzing the set of answers obtained, it is verified that the great majority of the answers were placed at level 4 of the scale, from which it can be concluded that there is a high degree of acceptance in relation to the introduction of AI in companies, the management of human resources, valuing not only the company, but the work of man. In the item Median, the value that divides the data set in two subsets with the same size is calculated, it is noticed that the value that appears in the majority of the answers is of level 4, that is, here also the value indicates and confirms the full acceptance of AI among the respondents.

Finally, on the standard deviation, which indicates how much a data set is uniform, identifies that the introduction of AI in society, having the lowest value of standard deviation, indicates that it is the most regular and that the introduction of AI in management of human resources having a higher standard deviation indicates that a it is less regular.

The fact that the introduction of AI in society has on average, its fashion and even median in response 3, makes it a slightly different variable from the others, did not

obtain concrete answers about this variable, the doubt is present on whether the introduction of robots into society can be beneficial, and there may be individuals who can accept this introduction, but there may also be individuals who may be reluctant to do so.

With the accomplishment and distribution of the questionnaire, answers were obtained to all the questions asked, being possible to draw conclusions according to these same answers. The majority of the answers focused on values 3 and 4, and there were answers in value 5.

However, the answers to question 27, which asked if robots can have emotions, most of the answers were 1, that is, people do not agree that robots can ever have emotions. It is thus questionable whether it is possible for robots to develop to be equal to humans that allows them the capability to have the capacity to self-develop, thus being able to express emotions.

The average of the answers given for each hypothesis was level 4, where the respondents in organizations and in the management and development of Human Resources, but with regard to their integration into society in general, there is some doubt there, and indecision before the possibility of interception with humans.

Any of the hypotheses are admitted and seen as something that can happen yet humans need to control all the advances that have been known, so that the robots do not surpass us, only develop like something that helps humans in the realization of the various tasks to be carried out day by day in the companies.

5. Discussion

The computers have several levels of creativity, at the lowest level, the computers paint and in the case of the "Lamus" system, created in Spain in 2012, it created a song without any human intervention. When the creativity of intelligent systems reaches higher levels, it will be a true revolution, the solutions that can be found will make a great contribution to the solution of the greater problems of humanity, providing great scientific advances in many areas where even today science experiences difficulties.

The main purpose of the implementation of AI is to create intelligent systems that approximate the intelligence capacity of human. With the evolution of these intelligent systems, it is possible that AI can exceed the capacity of intelligence of the human, and then, if it ever happens, there will surely be a need to create limits, to control and regulate AI, because no one wants a world controlled by robots

Are there risks to Humanity that with this technological advance that is expected to happen with the evolution of Intelligent Systems based on AI? The answer is not conclusive, but many find that it is not and that the implementation of AI in many sectors of activity will create new challenges and opportunities that will be very good for the development of humanity.

With the introduction of robots in companies, man is available to perform more complex tasks, develop skills, and even acquire new scientific knowledge, speeding up other tasks, opening new horizons and getting the most out of the interaction between humans and robots.

The introduction of AI through robots can bring benefits to companies, and can work together with humans, performing more routine and simple tasks, making room for humans to become more available for other more complex tasks, on the whole, bring benefits to institutions. (Guarino, 2018). On the part of the human resources

technicians, there must be confidence in these new technologies and in the integration in order to work together.

Robotization, over time, will have an evolution, which will transform the robots of today which are used in various tasks, and AI may turn out to be similar to human intelligence in some aspects. There are already well-developed robots in our society that help to perform surgeries, to work in call centers, and can reach a stage of development in which robots can evolve on their own (Moura, 2018).

When AI reaches very high levels that approach or can exceed the capabilities of human intelligence, the so-called "Superintelligence", then the scientists will have to assume the responsibility of creating ways to control this advance and give tranquility to humanity by creating mechanisms that ensure the use of intelligent systems with components and principles of ethics and morality that defend humanity.

6. Conclusion

It is considered that the introduction of AI may jeopardize some existing jobs, which may cease to exist, being the tasks performed by the robots, and there is no need for human labor.

Increasingly humans can be influenced and threatened by various cybernetic risks, and AI can do more and better than humans, stealing jobs and having more cognitive abilities and having more knowledge than man himself, being able to auto-transform - develop and evolve on their own.

According to the responses of several people to which the questionnaire was distributed, they considered that the robots will never have emotions and affections, being able to commit themselves when they are in more complex situations, forcing the humans to always be present, to solve problems in situations that require their participation.

It is also possible to affirm that some respondents consider that HR will never be replaced in its entirety by robots, being that the human is needed for the development of the company and to regulate the development of AI in the company. Generally speaking, from the answers obtained in this questionnaire, it is understood that people accept the coexistence with AI in the work place, although they express a feeling of fear and a lot of expectations about what they could represent in their lives and in society in general, as this technological evolution will inevitably bring great changes to people's lives.

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ANNEXE 1 – Questionnaire

1. Artificial Intelligence will be compatible with the irrationalities of man.
2. The introduction of Artificial Intelligence will influence how you will manage the Human Resources of a company.
3. Artificial Intelligence can be used in the strategy of making important decisions and organizing workers.
4. There may be integration and interaction between the machines with Artificial Intelligence and the Humans, and should not exceed ethical factors.
5. Robots will be a source of development and add value to all sectors of activity, and may be of added value to companies.
6. If Artificial Intelligence thinks faster than man and can predict which questions are to be answered, it will be able to answer the questions posed.
7. This introduction will modify the various tasks to be performed by Human Resources, being automated by robotics.
8. With automation in Human Resources there are changes in the way of working and areas that can be more developed.
9. The man is always necessary to be able to regulate what is the presence of the Artificial Intelligence in the company.
10. With the introduction of Artificial Intelligence, man will be left with more complex tasks.
11. Artificial Intelligence is capable of making important scientific discoveries, and if we are not able to understand the process, this is considered science.
12. Bringing companies together with Artificial Intelligence allows you to adjust not only working hours but also allows employees to have a better lifestyle.
13. Can Artificial Intelligence jeopardize existing jobs?
14. The creation of technology with artificial intelligence allows us to perceive and correct human behavior that is less ethical and morally unacceptable.
15. Considers it important, the insertion of Artificial Intelligence, for the labor industry, in the next 10 years.
16. The integration of Artificial Intelligence may create more jobs than it will destroy, arguing that its use is an opportunity to automate "repetitive tasks and low value added".
17. There must be collaboration between the man and the robots so that together they can achieve the objectives of the company.
18. Increasingly robots will be able to be closer to man, where the distinction between the two can be difficult in some tasks.
19. Artificial intelligence can produce false and implausible results for companies.
20. Societies can be intelligent and autonomous enough, taking advantage of what Artificial Intelligence is.
21. Robotics can be used to conduct interviews, obtain answers in real time and have a realistic selection, being decisive for the choice of true talents.
22. Artificial Intelligence can make mistakes in the various Human Resources processes.
23. Increasingly, robots will have cognitive skills that allow them to be faster in developing tasks, developing them faster and better than men.
24. It is possible for men to feel insecure and threatened by cybernetic risks.
25. Artificial intelligence is increasingly present in companies and in everything man uses.

26. Robotics allows Human Resources Management to be transformed into each company, and there may be a need to have Artificial Intelligence in the company.
27. Robots, like man, may have emotions and affections that may be important in more complex situations.
28. Robots will have capabilities that allow you to solve more complex problems, creative ability, critical sense and a lot of individual initiative.
29. The Artificial Intelligence allows to know the constant needs of the clients, being these in constant change.
30. Human Resources can never be replaced by robots in their entirety.

Innovation and Entrepreneurship

Embedding Ecological Requirements into New Products

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Abstract: This paper reviews the recently emerged field of design for environment. It is based on the author's long-term interest of the subject. Objectives and problems of design products with consideration of ecology are discussed in details. Need of taking into account full life cycle of the product is emphasized. Basic concepts of the product life cycle and their transposition to engineering design are outlined. Recommendations for avoiding pollution during the product utilization are described. After utilization, during the product end of life a number technologies exist, which should be considered as early as possible during the product development process. They are named at the end of the paper. Particular responsibility designers for development ecological products is the general premise of the paper.

Keywords: Product design, product life cycle, ecological products, design for environment.

1 Introduction

Ecology generally pertains to the study of relationships between various organisms and their environment. This includes consideration of plant, animal, and human populations in terms of rate of population growth, food habits, reproductive habits, and ultimate death. Growth of the world population, combined with the technological changes associated with our living standards, has created a greater consumption of our resources, resulting in potential shortages. The amount of wastes has increased significantly. The net effects of this have caused alterations to the basic biological process, and to some extent these alterations have been harmful. Those problems are of particular concern:

- Air pollution and control
- Water pollution and control
- Noise pollution and control
- Radiation
- Solid waste.

There is a growing need to design new products so that avoid or at least minimize harmful impacts for environment. This approach needs to take into consideration all processes involved in product production, use, and after using it, i.e. the product life cycle. As new product with its features is created in process of design and manufacturing, so it is rational to consider all 'ecological' features of the product during design (Graedel and Allenby 2010; Hundal, ed. 2002).

Many of the challenges related to worn out products are consequences of how the products were designed (Rohatyński 2016a; Rohatyński 2016b; Rohatyński 2009). In order to support the company's product development process, several eco-design methods and tools have been developed, which consider product end-of-life issues (Hundal 2002). Literature of the subject is quite rich but disperse, hence an attempt to make an overview here.

2 Product Life cycle

The product life cycle shown on Figure 1 starts from the market needs identification compared with technological capabilities of the company. For each instance the detailed specification of user needs and technological requirements must be performed. The crucial decision is to choose whether one type of product or the family of similar products (product platform), which would satisfy a wider range of consumers, will be manufactured (Blanchard and Fabrycky 2014).

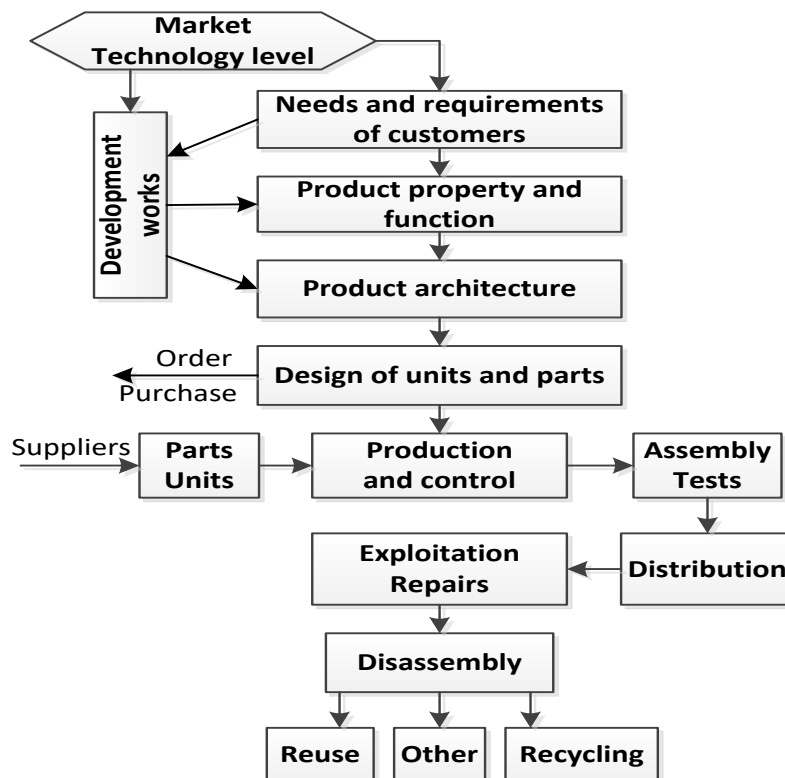


Figure 1: The life cycle of a product from identification of needs to end of use

For the products family their architecture and the range of their function have to be determined prior to the production start. The product architecture is created top-down, from assemblies to parts and allowing for manufacturing processes. The essential problem to solve is how to incorporate technological and functional qualities into the product.

When the product architecture has been set up engineers can begin design of units and parts of each member of the product family. One of the strategic decisions is then to make choice of cooperating suppliers because internal manufacturing costs often

exceed costs of outsourcing. Reconciliation of quality demands with the costs of manufacturing is also a critical challenge.

In this paper the particular attention is drawn to the post-operating period, when disassembly of the used product should get together with the decision about further processing of constructional materials.

The general diagram of the material cycle in industrial economy is shown in Fig. 2. It consists of four sectors: material procurement, production, users, and reverse (feedback).

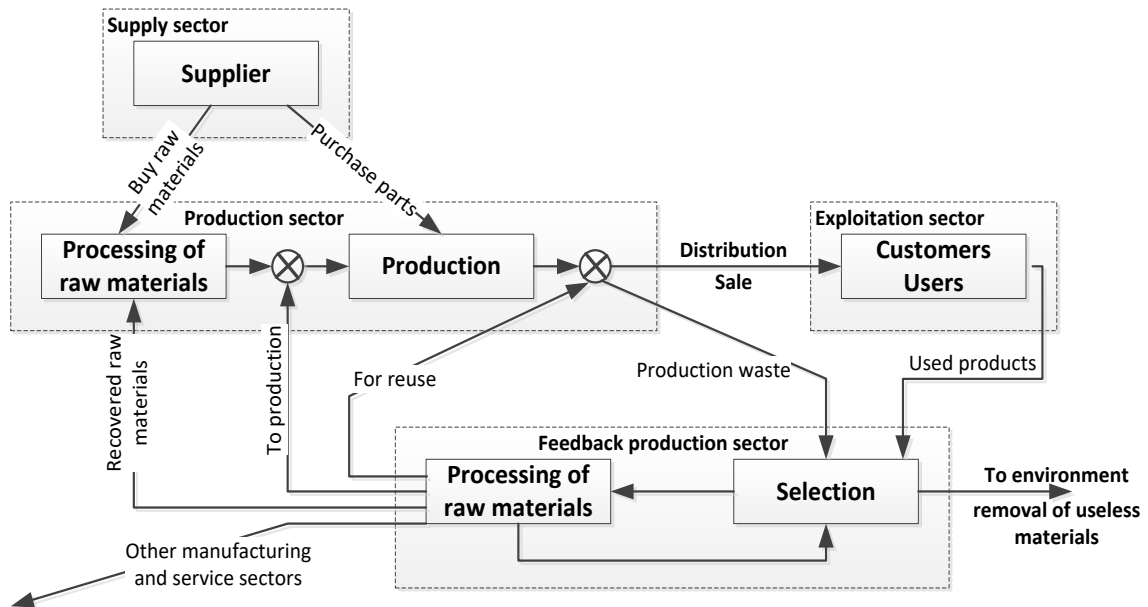


Figure 2: Block diagram of the production system with the material feedback (Whitney 2003)

The production sector besides off the shelf products generates also some defected ones, which are subjected to repair, recycling or retrieval. Useless residues are disposed. The reverse production sector collects used products from users. These products after dismantling and selection and further processing return to the production sector or are removed to the environment.

There are two types of feedback in the material cycle: internal of the production sector (not shown in Figure 2) and external one. These feedback types close the material products cycle, not completely however, because a part of the materials returns to the environment and may have impact on ecological equilibrium.

Designing a new product in modern technology is daunted challenge. It is not satisfactory to design a product that does what it is supposed to do. Tasks for the designer include the following after (Graedel and Allenby 2010, Ch. 9):

- Surveying customers to receive ideas for product characteristics (“products should not merely satisfy the customer, they should delight the customer”)
- Addressing competitive products. New designs must meet or exceed those of the competition, or they will be unsuccessful

- Complying with regulations. Product safety, labelling requirements and many of other legally binding constraints must be considered
- Protecting the environment. Design considerations that have environmental implications are increasingly a topic of interest to customers, regulators, and industrial managers
- Producing designs that are attractive, easy to manufacture, delivered on time and competitively priced. In today's business world, immediate customer acceptance, efficient manufacturing, and timeliness are crucial.

Simultaneously considering in the design all phases of the product life, including production, consumption, maintenance, and the end-of-life, is called ***Design for Life Cycle***. This implies that, even in the conceptual phase of a product, the design of appropriate production systems and dismantling operations should be considered. However, to apply such approach in practice a lot of information is necessary which is not available at the beginning of design. Moreover, solutions that are preferably from the environmental point of view are not necessarily of the value for clients. For example, the client may not prefer the cover of a car engine made from environmental friendly plastic. Thus, satisfying ecological requirements is not only important but also difficult task for producers.

3 Design for the Life Cycle in General

Direct subject of engineering design is product realization process. In general, it consists of five stages. At each stage relevant information about the product life cycle should be considered. If that information is taken into account in subsequent stages, a better overall result is likely.

'Design for Life Cycle' methodology considers all life of the product – from raw materials through their conversion, manufacturing and use to the after-use (reverse) period. Consideration of requirements for products and processes relevant to any phase of the product life is obligatory for engineers, particularly for designers (Figure 3). Products should be easy to repair and disassembly (possibly without destroying of elements), reuse and recycling. Product design should regard ecology in all product life – as in exploitation phase as after it. It means: use materials that meet ecological requirements, apply environment friendly technologies, avoid generation of harmful scraps and other toxic substances, minimize energy and water consumption, utilize renewable resources and so on (Beitz 1990; VDI Richtlinien 2243 2002). Materials should be kept as much as possible in a closed loop while the reminders should conform to the natural biological cycle.

In general, product realization process consists of five stages. At each stage relevant environmental information can be considered. If that information is taken into account in subsequent stages, a better overall result is likely. (Graedel and Allenby 2010, pp. 145-146)

Stage 1: From concept to preliminary design. The appropriate environmental tool at this stage is a list of product or process attributes that will be not permitted, for example: radioactive substances.

Information known: Principal materials, critical electrical characteristics, critical mechanical characteristics, size. Key manufacturing processes (with technology and chemicals).

Stage 2: From preliminary design to mature design. The availability of a reasonable complete design at this stage allows use of additional environmentally related tools and approaches. Hence, the activity at stage 2 is a review of environmental aspects of product and process design approaches, together with other associated guidance provided.

Information known: Major components, preliminary electrical design, preliminary mechanical design, preliminary visual appearance. Principal manufacturing processes (with technology and chemicals).

Stage 3: From mature design to Development. Environmental information at this stage can be derived from detailed guidelines and checklists. The review should evaluate the degree in which a product design incorporates recommended product attributes. It allows for corrections of environmentally unfavourable attributes before the product design is finalized.

Information known: All components, final electrical design, final mechanical design, final visual appearance, mould designs. All manufacturing processes (with technology and chemicals). Process energy consumption.

Stage 4: From development to Manufacture. Most items of environmental concern are identified at this stage but product delivery implications can be addressed in detail for the first time, and the overall results can be made quantitative to the degree desired.

Information known: Final materials list (constituents and quantities), recyclability, packaging. All by-product streams. All residue streams. Outside supplier interactions.

Stage 5: From manufacture to sales and use. It should be checked whether environmental issues have been properly reviewed at previous stages, whether the product delivery and marketing activities will meet environmental goals, and whether provisions need to be met for end-of-life activities such as product takeback or battery recycling. As soon as the manufacturing process begins, even in the pilot plant stage, audits for energy, water, and waste can begin.

Information known: Marketing and shipping.

Although described above sequence of stages is recommended, the way in which an individual corporation proceeds may be a function of the details of its environmental management plan. The important factor is a way that guarantee the use of environmental information at stage reviews.

Very important consideration is the amount of environmental impact produced by products when and after they are used. The use and maintenance of products after it passes to the consumer is largely constraint only by the product design. This circumstance places special responsibilities on the designer to envision aspects of design that minimize impacts during the entire useful life of the product.

Simultaneously considering in the design all phases of the product life, including production, consumption, maintenance, and the end-of-life, is called design for life cycle. This implies that, even in the conceptual phase of a product, the design of appropriate production systems and dismantling systems should be considered,

because these systems depend strongly on the design of product itself and vice versa. Yet to apply such approach in practice a lot of information is necessary which is not available at the beginning of design (Navin-Chandra 1994).

Designers of products and processes should be aware of long-term consequences of their particular decision. For example, the use of some solvents can be very harmful when millions of doses are applied.

Designers should be concerned with adaptation of the product to these requirements. They have to predict the product behavior in the utilization period. Duration of the product and its parts life should be estimated as well as its influence on maintenance, service, and repairs. Information resulting from this consideration is the basis for further product development.

To accomplish these tasks designers may use a number of tools developed over many years e. g. (Pahl and Beitz 2005; Booker et al. 2001; Boothroyd et al. 1994; Das 2002; Das et al. 2008), but many of these had been developed before environment became as important as it is now. There are many methods and tools that aid product realization processes, e.g. The Pugh's selection matrix, QFD, FMEA, and other methods of generation and evaluation of design problem solution e.g. (Otto and Wood 2001; Eder and Hosnedl 2008).

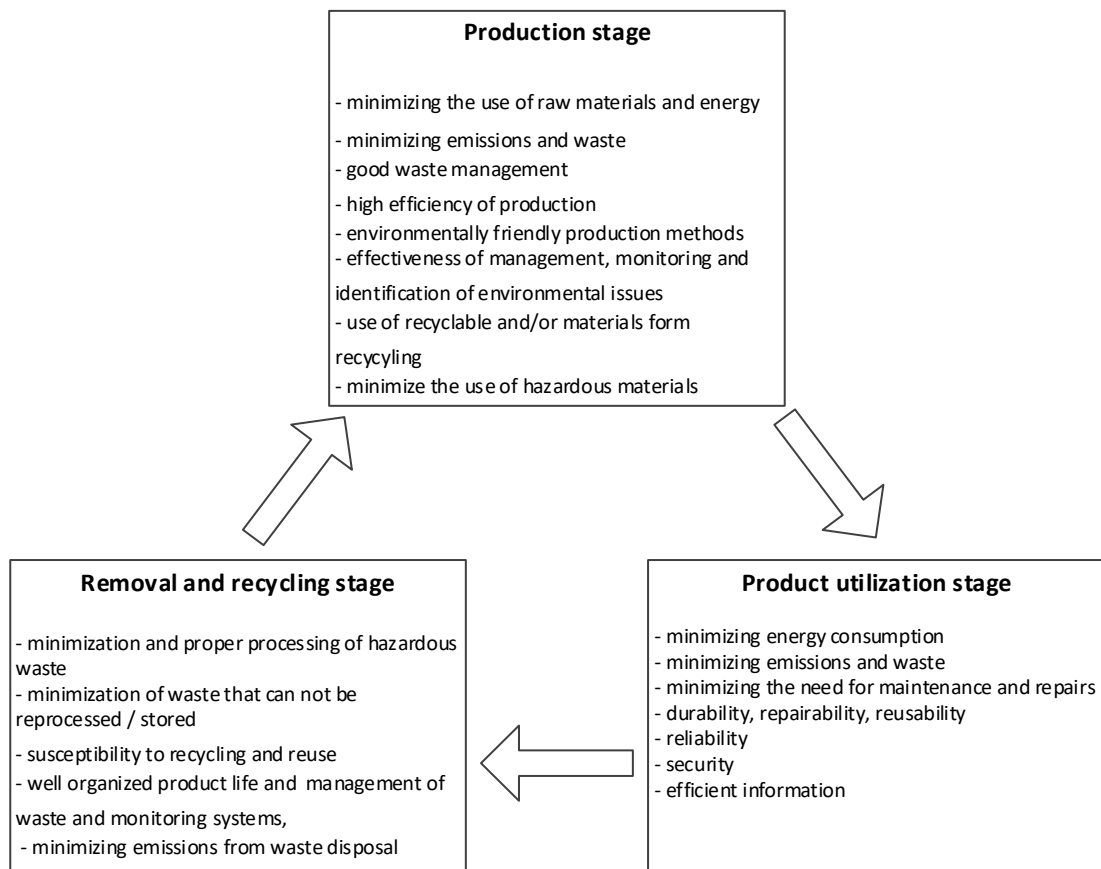


Figure 3: Requirements for product design related to ecology

The toolkits that aid the design for environment can be categorized in four groups (Graedel and Allenby 2010, Part III):

- Lists of component and materials that can violate environment
- Design guidance handbooks
- Life-cycle assessment
- End of life processes.

For environment friendly design the best approach is taking into account all product life cycle, or more exactly - all lifecycle of materials used to its manufacture and to the involved processes (Chen 2001). This approach is entirely considered in Design for X (DfX) methodology (Dixon 1991; Kuo et al. 2001). Here 'X' may be any of a number of design attributes, such as: Assembly, Compliance, Disassembly, Environment, Logistics, Manufacturability, Material and component applicability, Reliability, Safety and liability prevention, Serviceability, Testability, and so on.

The scope of Design for Environment extends far beyond the factory walls. The focus on all the topics raised by DfX requires that product and process design be performed by product design teams made up of individuals from a wide range of specialties. In addition to the appropriate mix of engineering specialists, such teams often includes environmental experts, packaging engineers, manufacturing engineers, marketing specialists, business planners, and perhaps financial and purchasing experts. The practice of using diversified teams for product design considerably complicates the process in its initial stages. The benefits, however, arise from the early consideration of the variety of attributes that will ultimately determine the success or failure of the product. Most features of a product are effectively set early in the design process. Participation of an industrial ecology expert on every design team effectively improves the environmental responsibility of the modern products.

Demands for reusing parts and materials result in formulation of a number of new sets of requirements for the modern products. They complement traditional set of the conventional design requirements. The general guidelines are listed in order:

- 1) Design of products adapted to remote repair or modification.
- 2) Comprehensive use of reliability information.
- 3) Design for predetermined life time.
- 4) Modular constructional structures for easy exchange of wear out parts.
- 5) Avoiding of noxious, difficult to disposal materials.
- 6) Design of products for which the manufacturer holds ownership for all their life cycle.

Product properties important for disassembly, recycling and other recovery processes show up in post operation phase only. Including these properties concurrently into design process is not an easy task. It is estimated that at least 80% product attributes have been decided during development process primarily at conceptualization. Consequently, design teams are responsible for taking into regard problems of the product reverse part life cycle including disassembly for remanufacturing (Ostlin et al. 2008). Designers are recommended to consider subsequently each phase of life cycle and note the pertinent requirements (table 1).

Table 1: Matrix of requirements in product life

Product life phases	Types of requirements					
	Engineering	Economics	Ergonomics	Law	Environment	More?
Planning						
Design						
Production						
Market						
Utilization						
Removal						
Recovery						

This can result in a base for benchmarking in order to rank a new product on market. After exchange of views and discussion among designers and experts from other disciplines, for example, enterprise managers, economists, and ecologists it is possible to answer for five cardinal questions.

First question is about the product structure, its material and function including physical processes. Its composition, size, appearance, etc. If it will consists of elements of different usefulness to recovery after end of life easy process of segregation during disassembly should be considered.

In second question assessment of disassembled elements value for the producer is considered. Recurrent use of some elements can be economically profitable, e.g. electric engines, joints and other. A preliminary list of required materials should be created not forgetting of principles of value analysis.

Potential threats to the environment is subject of the third question. A list of parts that need special treatment when not used again should be prepared. A look into problems in ecology that may arise in distant future is necessary

What will be treatment of retired products – who and how is going to make assembling and sorting: Producer, user or a professional firm? How many stages will the process consists of? What will be final result? This information will help formulate product design requirements. It is the content of the fourths question.

Finally, intention of the fifth question is searching for possible improvement of the product present concept. Is it possible to amend some ecological indicators by means of some parts exchange? How would it impact on the product long life? Duration of the product life and its parts should be estimated as well as its influence on maintenance, service, and repairs. Information resulting from these analyses is the basis for further product development.

Above questions complement the traditional approach to design by taking into regard product end of life processes.

During product conception, it is important to take into account strategies for updating the product due to rapid changes in technology as well as clients' needs. In this case, too, design for environment can give companies a significant market advantage (Kelle and Silver 1989; Klausner et al. 1999).

4 Design to avoid environmental pollution during the product utilization

Designers should be sensitive that small-scale decisions can make enormous impact on environment, as, for example, is the effect of the use of almost environmentally harmless solvents for pharmaceutical products when millions of doses are being manufactured.

The use and maintenance of products by the consumers is largely constraint by the design. This fact sets exceptional responsibilities down the designer in order to envision these aspects of the design that minimize detrimental impacts during the entire useful life of the product. Sometimes solutions that are preferably from the environmental point of view, are not necessarily of the best value for users. For example, a client may not prefer the cover of engine made from environment friendly plastic. Thus, satisfying ecological requirements although important may be a controversial task for a producer.

A short discussion of the environmental pollutions caused by a product residues is put below. (Allen 1994; Graedel and Allenby 2003, Chapter 13).

Solid residues. The design of consumable goods for reuse or efficient recycling is generally recommended. There are two principal approaches to such design. One is a design that permits ready recycling once the consumable item has been returned. Another one is design of a product for a specific infrastructure for it recycling. An example of the latter is the approach used by a number of corporations to recycle the cartridges from laser printers. Users are encouraged by clear instructions to return the cartridges for regeneration and reuse. Not only is this approach beneficial for environment but companies realize that cartridge reuse is much more profitable to them than using a new cartridge every time.

Liquid residues. The best are the designs that encourage the consumer to use all consumable fluid at once or minimize the quantity of fluids thrown away or use only fluids with a modest environmental impact. Extensive efforts should be made to recycle fluids.

Gaseous residues. Products whose use involves such processes as the venting of compressed gas or the combustion of fossil fuels require the industrial ecologist to explore design modifications to minimize or eliminate these emissions. The automobile's internal combustion engine is perhaps the most common example of such a product, and one whose cumulative emissions are very substantial, but anything that emits an odour during use is, by definition, generating gaseous residues, e.g. polymer stabilizers from plastics or vaporized fluids from dry cleaners. Replacements for the volatile chemical constituents will often be available if the designers look for them.

Dissipative products. Many products are design to be dissipative in use, that is eventually to be lost in some form to the environment with little or no hope of recovery. Examples include surface coatings such as paints or chromate treatments, lubricants, pesticides, personal care products, and cleaning compounds. Attempts are being made to minimize both the packaging volume and the product volume as, for example, in case of superconcentrated detergents. Alternatively, some liquid products that are dissipated when used can be designed to degrade in environmentally benign ways, e.g. some pesticides and herbicides or fertilizer for crops, where any excess spread on fields is dissipated to local and regional ground and surface waters.

5 Design for product end of life

A limiting factor for putting design for environment into practice is the low level of knowledge of product designers concerning about end-of-life strategies. This is due to the fact that a product's conception is usually centred on its functionality and costs, in detriment to environmental issues [16]. It should also be noted that to perform design for environment, product designers require specific expertise to develop the product with a view to its efficient treatment after utilization.

The part verification procedure depicted on Figure 4 may be implemented in the design in order to ensure that the product is suitable for post-operating period. Before an element is accepted the designers should consider its suitability to reuse, protection of environment, and cost. Can this part be used as it is somewhere else? If not, is it possible to design it for easy decomposition that at least some of its elements can be reused? If not directly then perhaps after a modification or recycling? Are these processes not too expensive? In case no reuse is possible then the material disposal should not detrimentally influence the environment.

The efficiency with which cyclization occurs is highly dependent on the design of products and processes; therefore designing for recycling (DfR) is one of the most important aspects of industrial ecology (Beitz 1990).

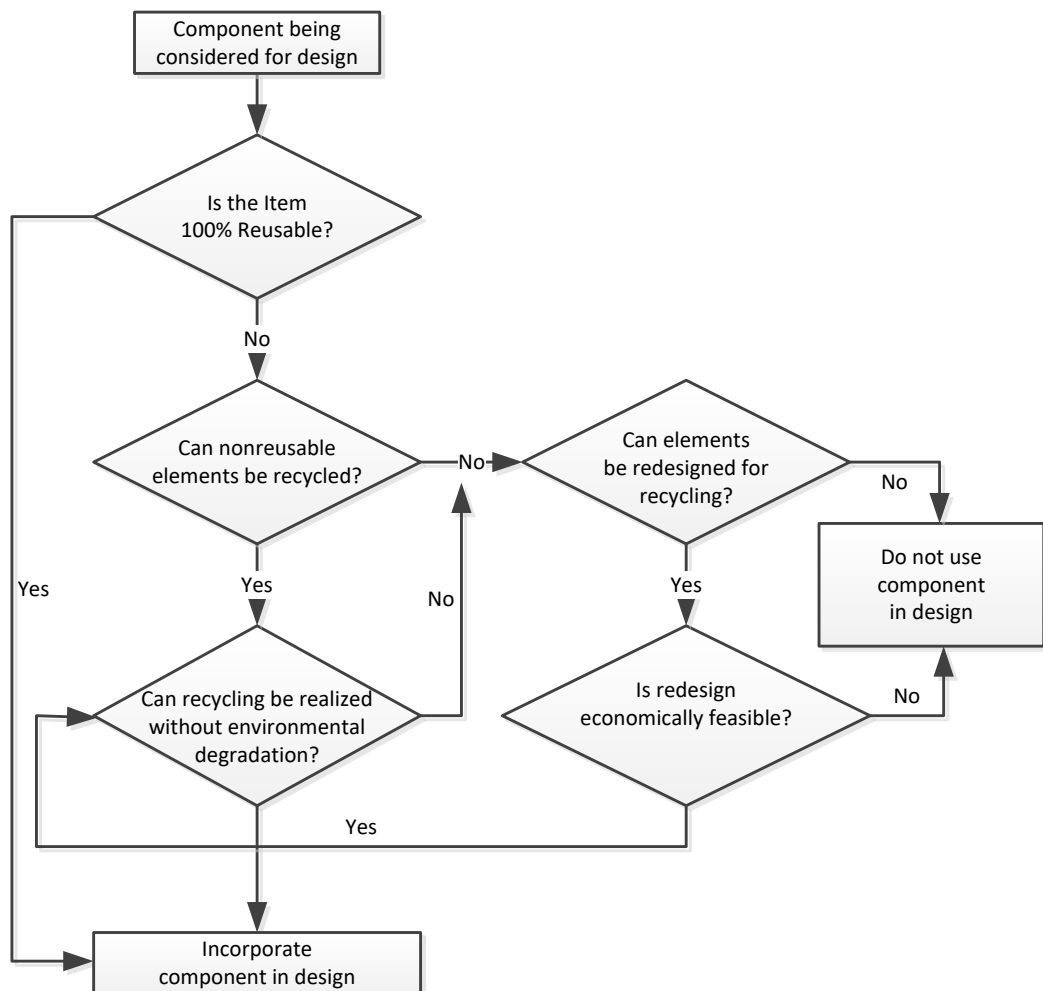


Figure 4: Evaluation of an element for its after-use processing after (Blanchard and Fabrycky 2014)

Demands for reusing parts and materials result in formulation of a number of new sets of requirements for the modern products. They complement traditional set of the conventional design requirements. The general guidelines are listed in order:

- 1) Design of products adapted to remote repair or modification.
- 2) Comprehensive use of reliability information.
- 3) Design for predetermined life time.
- 4) Modular constructional structures for easy exchange of wear out parts.
- 5) Avoiding of noxious, difficult to disposal materials
- 6) Design of products for which the manufacturer holds ownership for all their life cycle.

Above questions complement the traditional approach by taking into regard product end of life processes. A number of environmental features checklists have been prepared to offer general Design for Ecology guidance to product designers (Kaldijan 1992).

- Make it durable
- Make it easy to repair
- Design it so that it can be remanufactured
- Design it so that it can be reused
- Use recycled materials to make it
- Use commonly recyclable materials
- Make it simple to separate the recyclable components of a product from the non-recyclable components
- Eliminate the toxic and problematic components of a product or make them easy to replace or remove before disposal
- Make products more energy and resource efficient
- Make products manufacturable using environmentally superior processes
- Work toward designing source reduction-induction products (i.e. products that eliminate the need for subsequent waste)
- Adjust product design to reduce packaging.

5.1 Materials selection problems

It is obvious that materials should have the desired physical properties (strength, conductivity, index of refraction, etc.), desired chemical properties (solubility, photosensitivity, reactivity, etc.), and reasonable cost. However, to take into account ecological requirements, a number of additional properties is also to consider. The environmental and safety hazard, high energy embodied in the material, potential supply constraints, availability of a recycled supply of the material, the material substitutability, and so on.

The designers should select materials suitable to be reused, and will not cause any toxicity problems, and can be decomposed without adding to the solid waste dumps that unfortunately still exist. Care must also be taken to ensure that a product do not need for transportation containers or packaging that will cause environmental problems.

Detailed lists of improper material characteristics and hazardous materials have been prepared by European Union and governmental bodies. These lists are subjected to modifications in effect of progress of knowledge and when new materials appear. For example, in recent years extensive efforts have been made to determine what properties might make some materials more environmentally friendly than others, that is, to define the characteristics of “ecomaterials”. An operational definition of an ecomaterial is: ‘An ecomaterial is one whose acquisition and use cause minimal environmental impacts, minimal resource depletion, and minimal regulatory constraints to use’. According to this definition seven properties of ecomaterials can be enumerated:

- An abundant supply of the material exists
- A recycled supply of the material can be utilized
- The material requires low energy consumption in extraction, processing, and manufacturing
- The material has little or no associated environmental impact
- The material has no existing or anticipated legal restrictions
- The material can be used over extended time periods
- The material can be renewed and/or recycled.

To illustrate eco-material evaluation one can compare aluminium and a plastic composite for use in an automobile in the tropics. Aluminium is easy to supply (it is abundant), has little impact on environment, it is recyclability and has legal status. It is difficult for recycling supply (virgin aluminium is used in automobiles), and its processing requires substantial amounts of energy. Also, aluminium corrodes in salt air. The plastic composite is easy on supply, good in environmental impact, and energy consumption, but poor in the use of recycled material and in recyclability. In this example neither material is clearly environmentally superior, but on balance the aluminium appears slightly preferable.

Generally, Al, C, Fe, Mn, Si, and Ti, are easy to supply and cause no significant toxicity problems, and they potential for recycling is good. Conversely, As, Au, Be, Cd, Cs, Ge, Hg, In, Pb, Re, Tc, Tl, and Zn are in short supply and/or cause significant toxicity problems should be avoided or limited in use. Radioactive elements should be avoided with the possible exception of nuclear power applications.

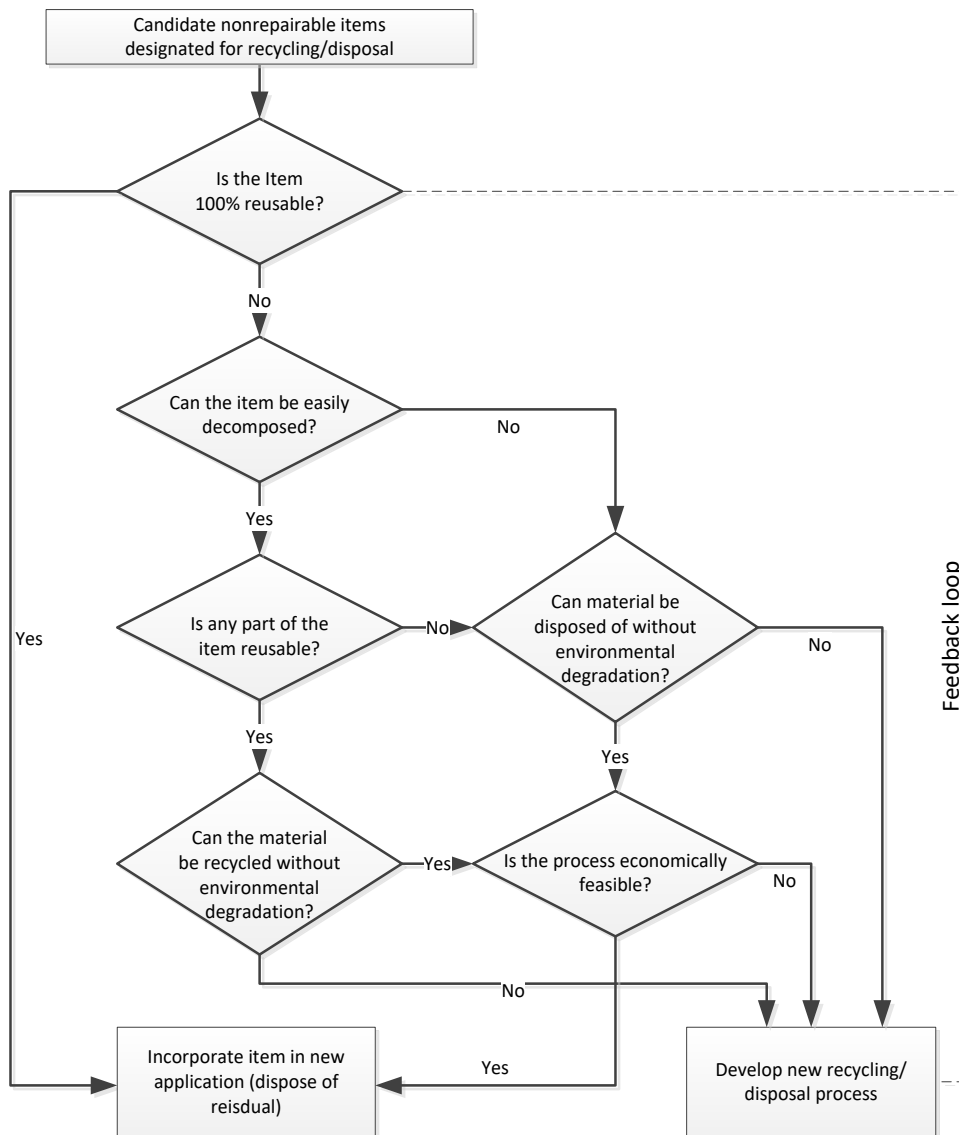


Figure 5: Evaluation of a part recyclability with allowance for ecology (Blanchard and Fabrycky 2014)

The materials selection process can be summarized in four recommendations:

- The needed materials should originate from recycling streams rather than through raw materials extraction.
- Abundant, nontoxic, nonregulated materials should be preferred.
- Minimum use of materials in products, in processes, and in service should be preferred.
- Longevity, refurbishment, and recycling increase the utility of materials, and enable recovery of materials when the use ceases.

No matter what materials are chosen for a product, the amount that is used can generally be minimized by careful designing involving stress analysis. The suggested rules are:

- Avoid sharp corners
- Use a greater number of smaller supporting ribs rather than a few large ribs

- Where sheets of metal or plastic are used, achieve strengths by providing support by bosses (protruding studs included for reinforcing holes or mounting subassemblies) and ribs, not by using thick sheets
- Gussets (supporting members that provided added strength to the edge of a part) can aid in designing thin-walled housings
- Metal inserts should be avoided in non-metal assemblies. If that cannot be accomplished, install them on break-off bosses.

Order of the particular steps in the procedure of evaluation an element in dependence of its material is shown in Fig.5. A particular technological operation (repair or recycling or renovation or crush, and so on) depends mainly of the element material.

If a part cannot be qualified to reuse then next proceedings follow as shown in Figure 4. These sequence of decisions takes directly into account requirements of ecology and protection of the environment.

5.2 Basic end of life technologies

Technological processes related to post-using phase are numerous and extremely complex. The ones that are frequently applied in industry are listed below.

Cannibalization of machine parts, in maintenance of mechanical or electronic systems with interchangeable parts, refers to the practice of removing parts or subsystems necessary for repair from another similar device, rather than from inventory, usually when resources become limited. The source system is usually crippled as a result, if only temporarily, in order to allow the recipient device to function properly again.

Core, used product, subjected to further treatment (renovation, repair, etc.)

Dismantling/disassembly, separation of components and materials for their recovery.

Recycling, the product does not work and cannot be repaired. In this case, the product will be recycled. It is the process of taking a component material and processing it to make the same material or useful degraded material.

Reemploy, the product has reached the end of his first life (e.g. the owner wants to discard it) but it is in working order and may be reemployed.

Refurbish/Recondition, are processes of restoring components to a functional and/or satisfactory state to the original specification. In recondition used elements are recovered to the state they had before use. This process is applied in manufacture.

Remanufacture, It is a form of a product recovery process that differs from other recovery processes in its completeness: a remanufactured machine should match the same customer expectation as new machines.

Renovation- to restore to good condition; make new or as if new again; repair.

Repair - the process of bringing damaged components back to a functional condition After repair, the product can be reused.

Reprocessing, conversion a product or material for other properties

Reuse, product no longer works, but it can be repaired. After repair, the product can be reused.

Reuse 'as is', implies that items are used by a second customer without prior repair operations or as originally designed.

Revalorization, any process for recovering original values of removed product or material

Upgrade/Restore. any process improving product functionality.

There is a variety ways to deal with used products. The best is to use the product again as it is or after slight modifications. Containers and boxes of multiple application are of good example. The next in the hierarchy is remanufacturing. Recycling follows in order. This technology processes materials of used products to other purposes thus preserving them in reverse life cycle. Accumulation of not processed products is in the end of the order. Yet they can still be utilize to produce biogas, fuel for power and the like. If even that is not feasible they should be located in safe, isolated from environment stores.

6 Summary

The paper presents an overview of issue on design for products conform to ecology. First, phases of the material product cycle have been addressed and concept of design for life cycle has been explained. Next, the design process and its stages has been discussed. Particular emphasis was put on these product requirements which are related to ecology. The designers should focus attention for resolving these complex demands by taking into account various points of view. This is possible in team work only. Two the most important designers' responsibilities discussed detailed in the paper are related with avoid the environmental pollution during the product use, and environment friendly, yet economical, material processing during all life cycle. Finally, different technologies applied for end of life products are enumerated.

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Innovation Performance of Family Businesses

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Abstract: The article addresses the issues of innovativeness of family businesses. Such entities must combine goals characteristic of the family and the enterprise. There is a belief that family businesses, due to limitations related to the specificity of this type of entities, are less innovative than non-family enterprises. The research problem of the article is the analysis of factors that may affect the innovation of family businesses. To solve the research problem, the dependencies between independent variables and dependent variable as the number of registered patents (innovation output) were examined. The analysis covered 218 of the largest European family businesses. The data was obtained from databases such as: Global Family Business Index, European Patent Office, Global Innovation Index and financial statements of the companies. The results show that the innovation of family businesses is influenced primarily by R&D expenditures. It was also concluded that the family businesses listed on the stock exchange have a greater degree of innovation. If the CEO is a family member, it also has a positive effect on the family enterprise's innovativeness.

Keywords: innovativeness, family business.

1 Introduction

1.1 The significance of family business in the economy

The specificity of family businesses was aptly defined by Lansberg, who stated that the owner family shapes the enterprise in a way that family members cannot do in enterprises that are not family owned (Lansberg 1983). The specificity of family involvement in running a business means that the family business is different from the others and there is a need to conduct scientific research in this area. Defining family enterprises turns out to be as difficult as determining their share in the economy. The concept of a family business functions in everyday language and has many synonyms, but in different cases it has different meanings. Difficulties in defining it arise at least for two main reasons. First of all, there are no formal criteria for distinguishing family businesses. We find here companies with various legal forms, ownership, size and various management methods. Secondly, in the concept of a family business, two entities collide: a family and a company having completely different goals. The first of them is a social institution with its aims of procreation, running a household, organizing the life of family members and securing its internal needs. However, the company has goals related to satisfying foreign needs, risk taking and economic independence (Safin 2007).

From a family perspective, it will create opportunities to meet the needs of related people, especially their own children, while from the company perspective it will employ only people with appropriate qualifications. In case of fulfilling the needs, the family will try to provide support appropriate to arising needs, while the company will provide the right salary to the contribution and market conditions. From the perspective of the enterprise, it is natural to differentiate and identify the best employees or business partners, while in family relationships a common rule is to treat all members equally. Finally, the family will create opportunities for everybody to learn in accordance to individual needs, while in case of a company, the possibilities of improving qualifications will depend on the needs of the organization, not the individual (Siefer 1996). The criteria used to define family businesses can be divided into three groups: broad, middle and narrow definitions (Table 1).

Table 1: Family business definition criteria

Criteria	Broad	Middle	Narrow
Ownership	Significant family shares	Control family shares	Major family shares
Strategic and management control	Minimum strategic control	Strategic control and particip. in management	Strategic control and full management
Succession	Not required	Expected family succession	multiple generations
family members involvement	Little direct family involvement	Some family involvement	A lot of family involvement

In narrow approach to family business definition, the family has a majority in voting rights and control the company in the aspects of strategy and management. In broad definition, the family keeps only significant share in voting rights having some strategic control.

Existing definitions describe the essence of a family business through three different criteria: ownership, ownership and management, and succession. By defining the concept of a family business, the authors place different emphasis on individual criteria. According to Donnelley, there is a family business when at least two generations of one family have had a significant impact on the company's goals and policies (Donnelley 2002). According to Frishkoff, a family business has any legal form, the company's capital is wholly or in the decisive part in the hands of the family and at least one family member has a decisive influence on the management or the managerial function itself with the intention of sustaining the enterprise in the hands of the family (Frishkoff 1995). Cadbury points out that a family business is a project that combines property, management and family responsibility for business (Cadbury 2000). Finally, as defined by Chua, Chrisman and Sharma, a family business is run with the help of family ownership and/or managers who intend to shape and/or continue the company's vision by a coalition that is controlled by members of one or several families in a way that makes it possible to maintain a vision between generations (Chua et al. 1999).

The specificity of this type of enterprises makes it legitimate to seek answers to questions regarding the development of such entities and to compete in a demanding market with large players. It should be noted that family businesses are a key part of the economy, accounting for 40-60% of GDP and 35-70% of jobs (Van Gils et al. 2008). It is estimated that family businesses constitute from 60-90% of enterprises in total, depending on the region of the world (Chang et al. 2010). The significance of family businesses for the economy is regionally determined. The largest percentage of this type of entities functions in South America. In Europe, the percentage of family businesses ranges from 61% in the Netherlands to even 90% in Estonia, Slovakia or Cyprus. Families are also the seeds of new companies. About 85% start-ups are started with family money.

Field research into family businesses has shown that this form of enterprise has significant benefits to the economy and society at large:

- family businesses are more profitable over the long term
- family businesses are less likely to lay people off and more likely to hire
- family businesses are generally better for the communities and engage in philanthropic activities
- family business generally take a long-term view and thus balance short-term rewards with long-term sustainability and prosperity
- family businesses use less debt and are therefore more stable.

Awareness of the existing limitations related to the participation of the socio-cultural factor that is the family for running a business leads to the answer to the question how to reconcile family and business goals, which are not always convergent. The problem of family businesses often indicated by researchers and observers of economic reality is the problem with the innovativeness of this type of enterprises which may constitute a serious brake on their development and building a competitive advantage (Dess and Picken 2000). Among the key characteristics that distinguish domestic companies from traditional entities, the most frequently mentioned are: constant and multifaceted interdependence of the enterprise and family, correlation of business strategy and family strategy, succession problem, use of family resources, organizational culture based on family values and social capital, which is the emanation of the family as primary social structure.

1.2 Innovativeness

The innovativeness of enterprises has been the subject of interest for practitioners and researchers for various groups of entities for many years. In most works, it is concluded that innovativeness is an essential source of competitive advantage (Dess and Picken 2000; Crossan and Apaydin 2010). Innovation is often treated as a process of knowledge generation, diffusion and application, stressing the importance of cooperation between enterprises to raise its level (Powell and Grodal 2005). Currently, it is common in the literature that competitive advantage understood from the point of view of innovation arises as a result of cooperation with external entities (Chesbrough 2003; Chiaroni et al. 2011). It is essential for the companies operating in today's highly competitive industries with shortened product life cycles to be innovative. Schumpeter investigating the topic of innovation behaviour of organizations concluded that innovativeness is an important factor for entrepreneurship (Schumpeter 1934).

Innovation is considered as an idea, a practice or an object that is perceived as new by an inventor or the entity adopting it (Rogers 1983). OECD and Oslo Manual define innovation distinguishing four types of it (OECD/Eurostat 2018):

- *product innovation* as a good or service that is new or significantly improved in technical specifications, components and materials, software in the product, user friendliness or other functional characteristics,
- *process innovation* as a new or significantly improved production or delivery method including significant changes in techniques, equipment and/or software,
- *organisational innovation* as a new organisational method in business practices, workplace organisation or external relations,
- *marketing innovation* as a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.

When analysing innovation from the perspective of an enterprise, it is necessary to look at it from the point of view of innovation input and innovation output. Taking this view into consideration, innovation inputs is the set of factors or resources that enable the development of innovation, while innovation output refers to the result and development of innovation. The basic example of innovation input are R&D investment (physical and financial resources) that is dedicated towards the exploration and exploitation of new opportunities. Innovation input should lead to innovation output in the form of patented knowledge or newly developed products or improved processes (Schmiedeberg 2008, Crossan and Apaydin 2010). In this case innovation output, researchers take into account 1-0 variable indicating that the innovation or a given type of innovation was introduced or not. This approach, although allows to quickly identify whether the company is innovative or not, says nothing about the degree of innovation. The second possibility is the use of variables showing the number of obtained patents, utility or industrial designs or number of new developed products or processes. For the purposes of this article, the second approach was applied.

1.3 Family business in innovation process

The innovativeness of family businesses (Casillas and Acedo 2007; Wright and Kellermanns 2011) is still an insufficiently researched phenomenon. Innovation is a key factor in the development and expansion of the company (Schumpeter 1934; Wolfe 1994; Cefis and Marsili 2006). The specificity of family businesses and the same restrictions they have can hinder the process of introducing innovations. The problem of innovativeness of family businesses is to a large extent related to low expenditures on research and development than in the case of non-family enterprises. This dependence may result from cautiousness in spending cash on precarious activities, risk aversion or, finally, resistance to changes. Studies show that despite spending less on research and development, family businesses do it much more effectively from the point of view of the number of patent applications (Huang et al. 2015; Duran et al. 2016). On the other hand, we find examples of research that contradict this thesis. Dibrell and Moeller showed that family businesses in the food sector are more involved in R&D investments, and family property is clearly and statistically significantly correlated positively with the culture of stewardship and the strategy of creating value for the client (Dibrell and Moeller 2011). The presence of the family in the management of the

company and thus the pressure to achieve the goals focused on the family, affects the management and implementation of resources (Sirmon and Hitt 2003), and thus the special involvement of family members who manage the company, has a complex impact on innovation. High family influence on management may negatively affect the process of introducing innovations. Family-managed companies benefit unskilled family members without proper knowledge. At the same time, qualified employees avoid family businesses due to fear of difficulties in professional growth and conflicts (Covin 1994; Kellermanns and Eddleston 2004).

2 Methodology

2.1 Hypothesis

The basic research problem is the identification of factors affecting the innovation of family businesses. In order to solve the research problem, data regarding the functioning of family businesses were obtained and their dependencies were analysed using a multiple regression model. The specificity of family business operations and the limitations resulting from the need to reconcile family goals with the organization's goals encourages to examine whether the level of family involvement can negatively affect the company's innovation. Commitment can be measured as the share of voting rights that belong to the family and the direct involvement of a family member by sitting in the company's bodies. With regard to such problems, hypotheses 1a and 1b are formulated with the following content:

Hypothesis 1a: *The percentage share of family ownership in the business will be negatively related to innovation output.*

Hypothesis 1b: *The family member direct involvement in the business will be negatively related to Innovation output.*

Along with the development of family businesses, some of them decide to share their shares with external investors by making them public through stock exchanges. This type of activity may result from additional capital needs of the enterprise. Therefore, hypothesis 2 was formulated with the following content:

Hypothesis 2: *Public listed family businesses are more innovative than private ones.*

2.2 Sample

The analysis covered 218 European family business included in the Global Family Business Index. Index lists the world's 500 largest family businesses. The largest group were German enterprises (79 enterprises), French (28), Swiss (19), Italian (17) Dutch (14) and Spanish (10). The remaining 51 enterprises are Danish, Portuguese, Turkish, British, Swedish, Ukrainian, Norwegian, Luxembourg, Croatian, Austrian, Irish and Greek. Majority of investigated family businesses were established before 1945 (123 family businesses representing 56% of all sample). Therefore, they are managed over several generations.

Dependent variable refers to the innovation output, as mentioned before, the number of patents was used to describe this measure. For each of the 218 companies the number of obtained patents was assigned. The data were collected from the European Patent Office.

Characteristic of family businesses was measured by 9 independent variables. Three variables characterize the importance of tradition and family influence on company management. They are: age of the company, family voting rights share (family management) and CEO being a family or non-family member (family involvement). Two variables measure the size of the company from the perspective of revenues and employment. The important measure is distinguishing if the company is listed on the stock exchange or not (public vs private company). Characterizing innovation input measure, the share of R&D expenditures in revenues were taken into account. The simple measure describing the country of origin was replaced by the Global Innovation Index of the country. It is better and more informative measure allowing to take into account country specific innovation incentives. The analysed family businesses were assigned to one of 7 sectors: Advanced Manufacturing & Mobility (58 companies), Consumer (69), Energy (25), Financial Services (17), Health Sciences & Wellness (11), Smart Infrastructure (26) and TMT (12). Table 2. provides complete definitions of the variables used in the analysis. Table 3. Presents descriptive statistics and correlation matrix. To check the multicollinearity the Variance Inflation Factor (VIF) was also calculated.

Table 2: Variable definitions

	Variable	Definition
1	R&D	It is defined as the ratio of a firm's R&D expenditures to total revenues as an innovation input measure.
2	AGE	It is measured as the number of years from the creation of the firm.
3	PUBLIC	A measure indicating if the firm is public than takes value 1 or private and taking value 0.
4	REVENUE	Total revenues in USD bn.
5	EMPL.	It is measured as the number of employees.
6	GII	It is measured as the Global Innovation Index of innovation performance metric for the country of origin.
7	INDUSTRY	1. Advanced Manufacturing & Mobility; 2. Consumer; 3. Energy; 4. Financial Services; 5. Health Sciences & Wellness; 6. Smart Infrastructure; 7. TMT (Technology, Media and Telecom).
8	SHARE	It is measured as family voting rights share in percentage. It is family management measure.
9	CEO	Measure indicating if the family member is the CEO than takes value 1 and 0 otherwise. It is family involvement measure.
10	PATENTS	It is measured as the number of patents for last 6 years. It is innovation output measure.

2.3 Results

Multiple regression model was used as a statistical technique to explore the relationship between metrically measured independent and dependent variables. The theoretical multiple regression model takes a form:

$$PATENTS = \beta_0 + \beta_1 R\&D + \beta_2 AGE + \beta_3 PUBLIC + \beta_4 REVENUE + \beta_5 EMPL + \beta_6 GII + \beta_7 INDUSTRY + \beta_8 SHARE + \beta_9 CEO$$

where:

$\beta_0, \beta_1, \dots, \beta_9$ - structural parameters of the model.

Multicollinearity analysis of independent variables by the Variance Inflation Factor (VIF) allow to assume that there is no multicollinearity (Table 3). All the variables could be included in estimation of structural parameters. Model 1a is estimated on the basis of all independent variables taken into analysis. As a result of the reduction of non-significant variables, the final model (Model 1b) was obtained (Table 4).

Table 3: Descriptive statistics and correlation matrix

	Mean	Std. dev.	1	2	3	4	5	6	7	8	9	10
1 R&D	5,54	3,64	1,00									
2 AGE	90,47	52,19	0,16	1,00								
3 PUBLIC	0,39	0,49	0,02	0,04	1,00							
4 REVENUE	14,98	27,36	0,06	-0,02	0,14	1,00						
5 EMPL.	29169	57732	0,07	0,07	0,19	0,45	1,00					
6 GII	56,42	6,62	0,07	0,08	-0,19	0,06	-0,05	1,00				
7 INDUSTRY	2,91	1,90	-0,15	-0,07	0,07	-0,03	0,04	0,03	1,00			
8 SHARE	79,41	23,26	0,00	0,01	-0,78	-0,18	-0,20	0,15	-0,09	1,00		
9 CEO	0,61	0,49	0,12	0,15	0,05	0,13	0,08	0,09	0,05	-0,02	1,00	
10 PATENTS	564	1675	0,35	0,10	0,15	0,46	0,26	0,14	-0,20	-0,10	0,20	1,00
VIF			1,07	1,07	2,65	1,32	1,31	1,07	1,05	2,64	1,06	

Table 4: Multiple regression parameters estimation results

	Model 1a					Model 1b				
	Patents					Patents				
	coeff	std err	t stat	p-value		coeff	std err	t stat	p-value	
Intercept	-2823,49 ***	1029,78	-2,74	0,0066		-2148,60 **	827,93	-2,5951	0,0101	
R&D	125,00 ***	26,03	4,80	0,0000		127,82 ***	25,71	4,9714	0,0000	
AGE	0,73	1,81	0,40	0,6876						
PUBLIC	601,57 *	305,63	1,97	0,0504		390,13 **	194,25	2,0083	0,0459	
REVENUE	24,01 ***	3,85	6,24	0,0000		24,81 ***	3,42	7,2641	0,0000	
EMPL.	0,00	0,00	0,78	0,4341						
GII	30,29 **	14,34	2,11	0,0359		30,04 **	14,23	2,1106	0,0360	
INDUSTRY	-144,54 ***	49,43	-2,92	0,0038		-145,95 ***	49,03	-2,9766	0,0033	
SHARE	6,38	6,40	1,00	0,3196						
CEO	325,61 *	193,45	1,68	0,0938		346,62 *	190,95	1,8153	0,0709	
Adj R2	0,35					0,35				
F	14,01 ***					20,82 ***				

* Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level

As a result of structural parameters estimation of multiple regression model of innovation output measured by the number of patents registered, we can conclude that the significant variables include: R&D, PUBLIC, REVENUE, GII, INDUSTRY and CEO. Innovation input characterized by the R&D expenditures in total revenues has a positive influence on innovativeness measured by the number of patents registered. More innovative are also public companies than private ones. Total revenues have also positive influence on the number of patents registered. Higher Global Innovativeness Index for the country of origin, more patents registered by the company. The industry sector, the company belongs is also significant for innovativeness. Family involvement in the management board, especially as the CEO has also positive effect.

The final form of the model 1b is expressed by the formula:

$$PATENTS = -2148,60 + 127,82R\&D + 390,13PUBLIC + 24,81REVENUE + 30,04GII - 145,95INDUSTRY + 346,62CEO$$

Analyzing the result of the estimation of the parameters of the multiple regression model, we can conclude that all significant variables have a positive impact on the increase in innovation measured by the number of obtained patents. In the case of the variable characterizing the industrial sector, we can conclude that the membership in a particular industry sector is also important.

3 Discussion

The limitations of family businesses resulting mainly from the need to take into account family goals in running a business cause that such entities may have difficulties in competing on the market, including raising their innovation, which is one of the basic elements of building a competitive advantage. Researchers indicate that family businesses are cautious about spending funds on research and development, and thus to stimulate the so-called innovation input. At the same time, there is a positive relationship when it comes to creating innovations understood as innovation output. It follows that R&D investments in family businesses are more effective than in non-family enterprises (Matzler et al. 2015). In accordance to estimated multiple regression model we can agree, that high R&D expenditures in total revenues induce positive effect on innovativeness. The company that is investing in research activity and spending money on new assets or intangible assets can expect positive results in creating new product processes or organizational and marketing innovations.

One of the sources of financing the enterprise is the capital market. The companies, especially mature ones, with an established position in the market, enter the stock exchange and gain additional capital for development. In case of family businesses, entering the stock exchange is a difficult decision because it involves the inclusion of external investors in the shareholding structure. This may result in the need to share power in the company. According to the analysis, family enterprises that have decided to publicly register more patent applications from family businesses operating outside the stock exchange. The company entering the stock exchange becomes more recognizable, and the fact of listing on the stock exchange is a kind of ennoblement and prestige. In addition, the company can expand its base of relationships that are different in the process of creating innovation. The subject of the study were the largest family businesses in Europe. It seems natural, therefore, that mature entities are looking for additional sources of raising capital for further development, which may be the capital market and the stock exchange. In the case of family businesses, this type of capital may be a problem and require the acceptance of a change in the ownership structure. The positive impact of the company's IPO on the increase in innovation activity can be generalized to the need to seek funds for financing investment projects, including R&D ones. As discussed above, R&D expenditures are a key factor for creating innovation.

Family business that is increasing revenues and market share can also be more innovative and able to finance innovation activity from generating sources from basic

activity. Total revenues refers also to the size of the company. Larger enterprises usually have higher research potential, they can afford to create separate R&D units as well as initiate relations with external partners. Larger entities also have greater opportunities to accept risk, which promotes the creation of innovations. Larger companies can also take advantage of economies of scale and implement innovations in the markets previously served.

The innovativeness of the country of origin has a significant impact on the improvement of innovativeness of enterprises, including family ones. The Global Innovation Index (GII) provides detailed metrics about the innovation performance of 126 countries. State and local government authorities can play a huge role in creating a climate for undertaking innovative activities by enterprises. Creating appropriate infrastructure, special economic zones, clusters and technology centers can undoubtedly stimulate enterprises to become more and more active in the area of R&D. The necessary legal regulations like tax reliefs for R&D expenditures, are indispensable for raising the level of innovation. Authorities should also create opportunities for raising capital to create innovations, through the use of external funds (EU, grants, subsidies, etc.). Besides, each family business belongs to the industrial sector. Some industries are more innovative from others. In some of them, like IT, the development of new products and processes is compulsory to be competitive. On the other hand, the companies within one sector create the relations that can stimulate R+D activity.

It turns out that enterprises in which a family member occupies the highest position (CEO) are therefore more innovative. Such persons have undoubtedly enormous potential. Frequently, from the early age they are familiarized with the specifics of the company's operations, which they will be leading in the future. They are thus aware of the tradition, they perfectly understand the vision and strategy of the company. This contradicts the claims that companies managed by high-level family representatives have an aversion to change and take risky ventures to which we can include innovation. The problem of taking over the most important positions in the company by a family member is connected with the problem of succession (Hauck and Prügl 2015). Business entities under the management control of one family member emphasize even more the family nature of the enterprise, often focused on family succession. It is connected with the choice of the right moment when you should hand over the reins to the successors. An interesting issue that could be the subject of further research is the age of people who should take over the rudiments after their predecessors. There is a belief that younger people can bring a breath of freshness to the company, be more inclined to create innovations that can imprint their own mark on the new face of the company. On the other hand, it is required that the predecessors allow the successors to introduce changes and their own organizational solutions. Unfortunately, the seniors of the family can claim their rights to continue to influence the family business even though they no longer have a formal legitimacy to manage it. The process of succession can cause conflicts, which can have a destructive effect on the organization, and certainly on the reduction of innovation activity (Kellermanns and Eddleston 2004).

4 Conclusion

Family businesses operate in the long-term perspective. The decisions taken by family businesses are no longer based on a purely economic basis. Certain visions and plans that today have no reason to exist may in the future constitute the competitive advantage of a family business that often refers to history and tradition. Family business culture can lead to innovation if it is used in the right way.

The analysis of 218 European family businesses made it possible to assess the impact of family involvement on the level of enterprise innovation. It was pointed out that family businesses in which the CEO is a member of the family are more innovative. In this context, it cannot be said that the family share in voting rights has a significant influence on innovativeness of the company. Splitting the shares with an external investor, for example through IPO, may result in an increase in the innovation of the family enterprise, which, while maintaining the key positions in the company by the family members, allows to still have a significant influence on the management.

The presented results extends prior research regarding family business innovativeness. However more research needs to be done as it was indicated by adj R-squares of 35% in multiple regression model. Investments in R&D, in terms of physical and financial resources, play a crucial role in increasing innovativeness in the aspect of registered patents. However, the importance of other variables perceived as innovation inputs should be considered. Innovation is an interactive process of knowledge generation, diffusion and application. The literature emphasize the role of collaboration between companies accessing external knowledge that can extend innovativeness (Powell and Grodal, 2005). The importance of relationships both within the organization, between family members and those related to external entities should also be subject to a broader analysis. Finally, an interesting aspect of further research could be the analysis of changes in the ownership structure in family businesses and its impact on the competitiveness of the enterprise within the framework of created innovations.

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Process Innovations Through a Strategic Alliance: the Importance of the Alliance Duration and the Size of Enterprises

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Abstract: The objective of this paper is to characterise substantial aspects related to acquisition and exchange of knowledge in a strategic alliance. In this context, the results of the empirical research are presented, to determine the significance of selected aspects of obtaining and sharing knowledge within the alliance. It was also applied the logistic regression models that allow to predict the probability of introducing a process innovation depending on the size of the company and duration of the alliance, as well as other variables characterising the company and the knowledge obtaining process. It was shown that obtaining, creating and sharing knowledge within an alliance determines the introduction of innovations by the enterprises. I also indicate that process innovations may potentially depend on the alliance duration and the size of the companies, as well as on others features that could determine the knowledge obtaining process. Finding the relationships between these variables and connecting them with the enterprise size and the alliance duration is an added value to what has already been achieved in this area. These proposals are an important course of action for companies in the context of acquiring or creating and transferring knowledge that forms the basis for innovation development.

Keywords: knowledge management, strategic alliance, process innovations

1 Introduction

Enterprises are forced to search for innovative solutions in various areas of operation: organisational, product-related, technical, information-related and others. High-quality innovative projects require clearly defined resources (including knowledge), or own capabilities, including various practices for managing innovations at the strategic and operational level (Ernst 2002). To meet these requirements, enterprises should look for new ways to reach and obtain resources, as well as capabilities based on knowledge, which will not bear the risk of becoming obsolete quickly. Knowledge and the ability to use it are becoming an imperative of building competitive advantage (Nonaka 2000). In this sense, knowledge is a set of non-material resources of an entity, resulting from human activity, whose application can be the basis of creating competitive advantage (Zhang et al. 2009). Among numerous sources of obtaining knowledge by an enterprise, we can distinguish external sources (e.g. clients, suppliers, partner enterprises, institutions and others) as well as internal sources (e.g. employees, unions created by

them, internal mergers and others). One of the effective ways to obtain new knowledge, competences and skills consists in establishing and executing cooperation with other enterprises within strategic alliances. In fact, this activity has become a popular strategy in many industries (Teng 2005). Thus, depending on the purpose of the alliance and thereby the type of complementary sought, companies can select to cooperate with various partners (van Beers and Zand 2014; Ashok et al. 2016).

Various external sources (from clients and suppliers to competitors and government bodies) constitute very rich source of knowledge. However, in order to be able to use it, an organisation must know how to identify what is interesting and useful in the external environment, obtain that knowledge, spread it and apply commercially (Zahra and George 2002). The rationale behind this tendency is to minimise the risk of investment, distribute operating costs among a larger number of partners, and ensure a more flexible (faster) adaptation to the changing conditions in the international environment. Knowledge management in agreements between enterprises takes into account the bilateral process of learning by partners. This includes obtaining knowledge from partners, creating new knowledge together, and finally, using it to create the value of the whole alliance, as well as of each partner enterprise. In this context von Krogh et al. (2000) emphasise that creating knowledge cannot be managed, but enabled. Knowledge becomes a key element in the strategy of enterprises participating in a strategic alliance, which as a consequence favours strengthening the innovative potential of the allies, as well as that of the entire alliance. Most of the research in that field focuses on the cognitive aspects of knowledge-related processes, such as absorptive capability or complexity etc., as well as on how they can affect the transfer of knowledge between partners (Foss and Pedersen 2004; Inkpen 2002; Capaldo et al. 2015). There were few attempts to identify the determinants that support knowledge acquisition through a strategic alliance, or to determine if the obtained knowledge favours implementation of innovations. Although knowledge is very valuable and can help enterprises gain competitive advantage, the process of obtaining knowledge is a difficult task, and can lead to as many problems as expected benefits (Junni et al. 2013). Managers of alliances must deal with problems related to organisational mechanisms of knowledge acquisition and sharing within the executed agreements. There are review works, largely based on the methodology of a systematic review of literature (Niesten and Jolink 2015; Kale and Singh 2009; Kohtamäki et al. 2018), deals with specific issues related to the premises and objectives of alliances, their results and success factors. However, the empirical studies carried out so far insufficiently contribute to the understanding of knowledge management practices in alliance and obtaining results in the field of innovation of cooperating enterprises (Natalicchio et al. 2017). Although this knowledge is well-established, this classification applies in particular to factors affecting knowledge management. There is a clear need to explore the analysis for demonstrating the relationship between the acquisition of knowledge in the alliance and the results of cooperation at the level of individual partner enterprises, measured by the development and implementation of innovative solutions (Meier 2011; Niesten and Jolink 2015). Therefore, the presented considerations as well as results and research conclusions foster the fulfillment of this research gap, which allows to better understand the conditions and mechanisms that favor the development and implementation of innovations within the strategic alliance. There is a surprising lack of consensus

regarding the basic processes related to the transfer of knowledge within the alliance and its results. The analysis of the systematic literature review of the alliance management indicates the existence of a cognitive gap in this area (Kohtamäki et al. 2018; Natalicchio et al. 2017; Niesten and Jolink 2015). It suggests the need for in-depth research on factors supporting learning in the alliance and their impact on the results at the level of partner enterprises (Meier 2011; Niesten and Jolink 2015; Natalicchio et al. 2017). This type of research would significantly expand the current knowledge base. In a broader context, there is also a cognitive gap regarding the way of transforming the knowledge absorbed in the alliance into innovations at the company level. Therefore, there is a need to fill this research gap, which would allow for a better understanding of the determinants of obtaining and diffusion of knowledge within an alliance.

2 The knowledge diffusion within strategic alliances

Intellectual assets of companies constitute the driving force of innovation and contribute to the increase of competitiveness by providing new opportunities to compete (Belderbos et al. 2018). Therefore, they can be the foundations for building, maintaining and/or strengthening competitive advantage by presenting new sources of obtaining it. Zack et al. (2009) suggest that the practices of knowledge management, which promote generating new knowledge and organisational learning, are of fundamental importance for achieving benefits based on innovation. Donate and Guadamillas (2011) also associate these practices mainly with product innovations, creating new sources of competitive advantage. This ability to create competitive advantages is determined by the flexibility of operations achieved through quicker introduction of new products/services adjusted to the changing needs and preferences of customers. The process of creating knowledge consists in transforming the intangible knowledge into a formalised form, updating and modifying learning routines to suit innovation efforts better (Walsh et al. 2016). The process of knowledge management serves this purpose, resulting in improvement of the strategic characteristics of an enterprise (value, intellectual potential, or competitive advantage). Sarala et al. (2016) found that knowledge transfer between cooperating enterprises is universally considered an important source of competitive advantage and can be defined as “successful knowledge transfer, including sending or presenting knowledge to potential recipient and absorption of knowledge by the recipient” (Sarala et al. 2016). In this context, Ramadani et al. (2017) argues that innovation activities are inherently related to the enterprise’s performance, which is also influenced by knowledge spillovers and innovation activities. Many authors focus on internal factors within the alliance, they emphasise the significance of social-cultural connections between companies and the relational capital that can help partners foster innovation and creativity (Subramanian and Soh 2017; Cuevas-Rodriguez et al. 2014; Ho and Wang 2015; Vlaisavljevic et al. 2016). These connections complement employees’ skills, trust, effective management of cultural integration, the routine of sharing knowledge and HR flexibility (defined as adaptation to changing conditions). All these factors constitute another reason for considering the processes of knowledge management and sharing through strategic alliances. However, absorption capabilities and organisational inertia exert conflicting pressure on the search and exploration in relation to the function of the alliances value

chain, partners' attributes and position (Lavie and Rosenkopf 2006). However, even the research analysing the characteristics and features of a company resulted in outcomes different from the previous studies on search and exploration. For example, Rothaermel and Deeds (2004) noticed that exploration increases relatively to the size of a company, whereas Beckman et al. (2004) proved that the size of a company also contributes to searching for resources.

3 A knowledge-based approach to innovations

Knowledge management is a set of actions, initiatives and strategies used by companies to generate, store, transfer and apply knowledge with the purpose of improving organisational efficiency (Zack et al. 2009). This process involves e.g. transfer of *know-how*, getting to know organisational procedures and programs, or the company's strategy. According to the knowledge-based view on business efficiency, organisations operate as mechanisms that help to transfer knowledge through the development of absorption capabilities (Junni and Sarala, 2013; Hong and Snell 2013). This constitutes a peculiar structure for transferring and sharing knowledge within the frame of concluded agreements. Enterprises enter a cooperation convinced that the transfer of skills and knowledge will be mutually beneficial – it is one of the essential factors affecting the success of a planned strategic alliance (Khamseh and Jolly 2014). For this purpose, a company can either cooperate fully, or within certain limits. Full cooperation incurs substantial costs related to teaching the ally, and as a consequence possibly strengthens one's future competitor. Due to the benefits resulting from such an exchange, full cooperation is more desirable than the one where both parties limit their cooperation (Kale et al. 2000; Liu et al. 2010; Yam and Cliff Chan 2015). The possibility to obtain missing competences and root resources through cooperation favours entering into strategic alliances, which provide a quick and relatively easy way to complement the desired resources and boost innovation by enhancing combinatory search (Lee et al. 2017; Asgari et al. 2017). Van Beers and Zand (2014) argue that accessing and combining the knowledge and capabilities of partners crucially contributes to innovation performance. However, alliances based on knowledge, founded on combining intellectual resources and mutual knowledge exploitation, need to be managed in a different way than traditional agreements. It is associated with a higher risk of uncontrolled takeover of intellectual assets by an alliance partner (Alcácer and Oxley 2014; Martínez-Noya and García-Canal 2015), than in the case of heavily guarded and evidenced tangible assets. This also requires significantly higher capabilities and better control of both alliance partners. In fact, the degree of differentiation regarding partners' characteristics (Jiang et al. 2010) can result in divergence from the anticipated outcomes, and it could act as a 'double-edged sword' for knowledge acquisition (Wang and Chen 2016). On the other hand, cooperation within an alliance does not require incurring as high costs as those related to a takeover or a merger. At the same time, the threat of unfair copying, as well as possible legal sanctions, are eliminated. The problem of enterprise convergence resulting from copying good examples is also avoided. Ahammad et al. (2014) emphasise that transferring knowledge to and from partner enterprises may lead to developing a permanent competitive advantage. Therefore, people engaged in managing such type of undertakings should provide support and

resources in order to guarantee a steady knowledge transfer. Combining various resources and skills of enterprises within the alliance creates a synergy effect, and triggers the process of mutual learning of partners (Howard et al. 2016; van Beers and Zand 2014). Moreover, integration of internal and external innovation resources is the guidance for sustainable growth practices of entrepreneurial enterprises (Pan et al. 2018). That undoubtedly creates added value and facilitates strengthening of the competitive advantage of the allies.

These issues also include the concept of a learning organisation, which is perceived as a dynamic subject, characterised by a constant increase in its own operational flexibility, as well as a high degree of adaptation to changes in the environment. Cooperating within strategic alliances provides access to the sought for (missing) knowledge and enables achieving strategic flexibility (Schoorman et al. 2007; Park et al. 2002). Therefore, the process of learning should not be perceived as a motivation to create strategic alliances, but as a determinant in the process of alliance management, as the obtained knowledge is of essential importance for the evolution of an alliance. Strategic alliances can generate knowledge, which then will be used by the ally partners to strengthen their own strategies, possibly unrelated with the areas of alliance operation (Khamseh and Jolly 2014; Junni and Sarala 2013). The so-called strategic alliance competences (Inkpen 2002) created in this way constitute an autonomous value of an agreement resulting from the transfer of partner's capabilities. These could bring unilateral benefits for enterprises in the future, such as creating knowledge concerning various aspects of organisational operations: from products and technological processes to managerial practices (Andreeva and Kianto 2012). This knowledge can be used for undertaking tasks other than the ones within the alliance, improving products or entering new markets. This resource of an enterprise constitutes a value that would not be obtained by the company without participating in a strategic alliance.

Huang et al. (2015) emphasize that partner's ability to learn new knowledge through its cooperation within the alliance requires sufficient technical understanding to capitalise on that knowledge. A close, personal relationship between partners favours this and the quality of alliance relationship has a positive impact on the innovation performance of the enterprise (Xie and Jing 2017). Learning or transferring such *know-how* depends on the environment of the transfer, and on the mechanisms existing between alliance partners. However, von Hippel (1988) and Marsden (1990) argued that close and intense interactions between individual members of interested organisations work as an effective mechanism for transferring or learning of tacit knowledge. Tacit knowledge is very difficult to transfer outside the boundaries of an organisation, as it is based on common experience and is deeply rooted in everyday practices in the scope of learning, coordination and communication (Feinberg and Gupta 2004; Gupta and Govindarajan 2000; Nielsen and Nielsen 2009). Communication among enterprise members also has a direct impact on collective entrepreneurship, and contributes to broader understanding of markets, products, and technologies (J. Yan and L. Yan 2016).

Accumulation of knowledge obtained through an alliance is based on a conscious transfer of bilaterally contributed resources based on the needs of the partner enterprises, conducted through strategic meetings, staff exchange, directing the flow of knowledge etc. After the knowledge has been shared and accommodated in relation to

routine operational procedures, it needs to be codified in organisational memory (keep or store knowledge). This codified process of organisational memory results in an effective distribution of organisational knowledge. This knowledge consists of previous individual experience, existing and new internal operational procedures, and any type of knowledge related to organisational operations (Zollo and Winter 2002). It also leads to an increase in the capability to generate new ideas and own knowledge (Liu et al. 2010; Richter and Vettel 1995). Finally, it increases the extent of innovations implemented by the companies participating in the alliance.

4 Methodology

Empirical research was conducted on a group of 70 enterprises that started cooperation in a strategic alliance. The selection of units for the study was purposeful, while the general population consisted of 76 enterprises belonging to one of the industrial clusters in Poland. The research sample consist of companies from different sectors. The major group (25 companies) are the companies manufacturing plastics and rubber products. The second biggest group (20) are the companies producing machines and equipment. Other companies operate in the following sectors: metal products manufacturing (9), wholesale trade (4), production of chemicals (3), architecture and engineering (3), activities related to software and IT consultancy (2), activities related to real estate (1), activities of head offices and consulting (1), repair, maintenance and installation of machinery and equipment (1), and production of computers, electronic and optical products (1). The enterprises were divided into 3 groups: small (employing up to 50 people) – 27 companies, medium (employing less than 250 people) – 31 companies and large (employing over 250 people) – 12 companies. Additionally, all the alliances formed by them were classified according to their duration: ones that have lasted for 1 year, from 1 to 3 years, and more than 3 years. Despite the abundance of the many determinants of success of the alliance classification we can find common elements that are most often mentioned as key success factors in the alliance. These are (Ireland et al. 2002; Kale and Singh 2009; Orr et al. 2011; Feller et al. 2013; Schreiner et al. 2009; Niesten and Jolink 2015): defining tasks of the alliance, trust, strategic adjustment, number of employees in the team, informal communication, complementarity of resources. These factors were adopted in this study as variables to exemplify the empirical assessment of these factors in the knowledge diffusion in the alliance. The data was collected using an electronic questionnaire, and the representatives of management were asked to evaluate the influence of six previously specified categories (simplification of the alliance tasks, trust, strategic match, number of employees in a team, informal communication, complementarity of resources) on the exchange and sharing of knowledge with a partner enterprise within the formed strategic alliance. For this purpose, a score ranging from 1 to 5 was used, where 1 means no influence of the evaluated quality on obtaining and sharing of knowledge, 2 – low influence, 3 – medium influence, 4 – significant influence, 5 – essential influence. The conducted research provided data concerning the implementation of innovations (product, process and organisational innovations) that resulted from the new knowledge and skills obtained through the alliance. Additional characteristics of the investigated companies were acquired from the EMIS (Emerging Markets Information Service) corporate database.

The data include financial variables, such as total revenues, EBIT, ROA, book value and other information, including employment, age of the company, and the sector it belongs to. All these measurable variables were included in the logistic regression models described below. Table 1 presents basic statistics of quantitative variables that were taken into account in the analysis.

Table 1: Descriptive statistics of quantitative variables.

	Mean	Median	SD	Min.	Max.
Total revenues (in thousands of PLN)	36647.09	19918.27	45584.99	1498	219684
EBIT (in thousands of PLN)	2905.66	2067.30	3148.69	-54	20626
ROA	0.19	0.12	0.30	-0.05	2.44
Book value (in thousands of PLN)	12505.57	7659.24	14628.96	-2	73253
Employment (in numbers)	126.33	90.00	118.60	1	350
Age (in years)	10.34	11.00	5.55	2	29

In many cases, the decision-making processes are based on multiple regression models, i.e. in which we analyse the impact of several independent variables on one dependent variable of the measurable type. However, in a situation where the dependent variable is of the dichotomous type, we should apply logistic regression.

The logistic regression model is based on a logistic function. This function is defined by the formula (Hosmer and Lemeshow 2000):

$$f(z) = \frac{e^z}{1+e^z} \quad (1)$$

The logistic function has values from the interval $<0; 1>$. The logistic regression equation, like the linear regression equation (Ferguson and Takane 1998), allows us to calculate the expected value of the dependent variable. Because the logistic regression model applies to dichotomous dependent variables (taking only two values: 0 and 1), the expected value of the dependent variable Y has been replaced by the conditional probability value that the dependent variable Y will take the value 1 for the independent variables x_1, x_2, \dots, x_k . Based on the properties of the logistic function, it follows that both of these values (the expected values of the variable Y , and the conditional probability of assuming the value 1) are equal. Hence the logistic regression model for a dichotomous variable is expressed by a formula (Kleinbaum and Klein 2002):

$$P(Y = 1 / x_1, x_2, \dots, x_k) = \frac{e^{a_0 + \sum_{i=1}^k a_i x_i}}{1 + e^{a_0 + \sum_{i=1}^k a_i x_i}} \quad (2)$$

where:

$P(Y=1/x_1, x_2, \dots, x_k)$ - conditional probability of reaching the value of 1 by the dependent variable with specific values of variables x_1, x_2, \dots, x_k

a_0 - regression constant for logistic regression

a_1-a_k - logistic regression coefficient for the i -th independent variable

x_1-x_k – independent variables, which can be both quantitative and qualitative

In logistic regression, apart from the interpretation of regression coefficients, one parameter still present - the odds ratio. It is the ratio of the probability that an event will occur to the likelihood that it will not. It can be expressed by the following formula:

$$S(A) = \frac{P(A)}{1-P(A)} \quad (3)$$

The odds ratio for individual variables can be expressed according to the formula:

$$OR(x_i) = e^{a_i} = \exp(a_i) \quad (4)$$

When the selected independent variable increases for a unit, the odds ratio changes by $\exp(a_i)$ times. If $\exp(a_i) > 1$, it is expected to increase the odds ratio, whereas when $\exp(a_i) < 1$, it is expected to decrease the odds ratio. In the case when the independent variable is a zero-one variable, the $\exp(a_i)$ indicates how many times the ratio for a dependent variable equal to one increases.

Estimating logistic regression models I try to predict the probability of the introduction of process innovations, depending on sets of variables. These include: total revenues (TR), EBIT, return on assets (ROA), book value (BV), employment (EMPL), age of the company (AGE), as well as: alliance duration (DURATION), size of the company (SIZE), sector to which it belongs (SECTOR). I also included those related to the process of acquiring knowledge through an alliance: simplification of alliance tasks (SIMPL), trust between allies (TRUST), strategic match (SM), smaller employee teams (SET), informal communication (IC) and complementary character of resources (CR). There were used three logistic regression model defined by:

$$P(Y = 1 | X_1, X_2) = \frac{e^{a_0 + \sum_{i=1, j=1}^{15} a_i x_j}}{1 + e^{a_0 + \sum_{i=1, j=1}^{15} a_i x_j}} = \frac{e^{a_0 + \sum a_1 x_1 + a_2 x_2 + \dots + a_{15} x_{15}}}{1 + e^{a_0 + \sum a_1 x_1 + a_2 x_2 + \dots + a_{15} x_{15}}} \quad (5)$$

where:

X_1 – total revenues (TR) in thousands of PLN,

X_2 – earning before interests and taxes (EBIT) in thousands of PLN,

X_3 – return on assets (ROA) in decimals,

X_4 – book value (BV) in thousands of PLN,

X_5 – employment (EMPL) in numerical values,

X_6 – age of the company (AGE) in number of years from establishing till 2018,

X_7 – sector belonging (SECTOR), taking 1 for production of chemicals, 2 for plastics and rubber products manufacturing, 3 for metal products manufacturing, 4 for production of machines and equipment, 5 for wholesale trade, 6 for activities related to software and IT consultancy, 7 for activities related to real estate, 8 for activities of head offices and consulting, 9 for architecture and engineering, 10 for repair, maintenance and installation of machinery and equipment, 11 for production of computers, electronic and optical products,

X_8 – size of the company (SIZE), taking 1, 2 or 3 values respectively for small, medium and large companies,

X_9 – alliance duration (DURATION), taking 1, 2 or 3 values respectively for agreements till one year, more than one year till 3 years and longest than 3 years,

X_{10} – the level of simplification of alliance tasks (SIMPL), and, taking values from 1-5,

X_{11} – the level of trust between allies (TRUST), taking values from 1-5,
 X_{12} – the level of strategic match (SM), taking values from 1-5,
 X_{13} – the level of smaller employee teams (SET), taking values from 1-5,
 X_{14} – the level of informal communication (IC), taking values from 1-5,
 X_{15} – the level of complementary character of resources (CR), taking values from 1-5,
 Y – introduction of process innovation (1 for successful introduction and 0 for an absence of process innovation),
 a_0, a_1, a_2 - a_{15} - structural parameters of the model.

5 Findings

The conducted research allowed to establish the percentage share of the researched features that determine obtaining and sharing knowledge within strategic alliances formed by the studied Polish enterprises. The outcomes are presented in Table 2.

Table 2: Evaluation of the features that determine obtaining and sharing of knowledge within a strategic alliance (N=70)

	No significance		Poor		Medium		Significant		Essential	
	No. of indications	Structure	No. of indications	Structure	No. of indications	Structure	No. of indication	Structure	No. of indications	Structure
<i>Simplification of alliance tasks</i>	14	20%	22	31%	11	16%	16	23%	7	10%
<i>Trust between allies</i>	0	0%	16	23%	10	14%	25	36%	19	27%
<i>Strategic match</i>	1	1%	9	13%	12	17%	32	46%	16	23%
<i>Smaller employee teams</i>	12	17%	25	36%	8	11%	16	23%	9	13%
<i>Informal communication</i>	2	3%	15	21%	26	37%	19	27%	8	11%
<i>Complementary character of resources</i>	0	0%	2	3%	22	31%	34	49%	12	17%

The research results show that the studied enterprises most often reported strategic match between cooperating enterprises (obtained 48 evaluations of significant or essential influence), complementary character of resources (46 indications of significant and essential influence) and trust between allies (44 evaluations of significant and essential influence) as the features that, in the opinion of management staff, influenced the most their knowledge acquisition and sharing between partners in an alliance. Therefore, we can state that partner enterprises are aware of the fact that both the common mission, as well as vision and strategy of mutual agreement, and inherence of the resources contributed resources to the alliance constitute significant determinants

for the process of knowledge management in a strategic alliance. Additionally, very interesting is the fact that the enterprises involved in the research valued the significance of the level of trust towards their allies regarding their intentions concerning development perspectives of the mutual agreement. There is a separate question of the uncertainty and risk that one of the partners might take opportunistic actions. Among the factors which have the least influence or no influence on knowledge acquisition and sharing within an alliance, the researched enterprises chose the necessity to simplify the tasks of an alliance (36 indications as poor or no significant influence), and forming smaller teams of employees responsible for completing tasks (37 indications). This could be a consequence of diversity in the scope of the tasks, and frequently the engagement of different employees depending on the stage of a common undertaking.

Another very interesting effect was found in the conducted research, it was related to the data demonstrating the correlation between characteristics of an enterprises and formed alliances and the implemented process innovations as a result of executing an agreement (Table 3). In this case the correlations were also analysed in terms of the size of an enterprise (small, medium, large) and the duration of an alliance (up to 1 year, 1-3 years, over 3 years).

Table 3: Numbers of process innovations implemented as a result of forming an alliance (N=70)

Size of an enterprise	<i>Small</i>	9
	<i>Medium</i>	29
	<i>Large</i>	12
Duration of an alliance	<i>1 year</i>	2
	<i>1-3 years</i>	31
	<i>Over 3 years</i>	17

The data presented in Table 3 shows that most of process innovations were implemented by medium enterprises, which might result from their high development potential, whereas fewer of those innovations were implemented by large enterprises. Perhaps they aim at different effects resulting from a formed alliance than innovations. In 11 instances of formed alliances no innovations were found. However, it is noteworthy that this mainly concerns small enterprises, which may not possess the competitive potential yet, or the duration of an alliance is still too short for effective development and implementation of innovative solutions. We can also observe that the majority of process innovations were implemented by enterprises that have been engaged in an alliance longer than 1 year (alliances from 1 to 3 years and over 3 years). Therefore, it can be concluded that developing and implementing process innovations within an alliance requires time, whereas frequent disappointments in this type of agreements result from not gaining quick benefits related to quick joint implementation of innovations.

I also estimated logistic regression models for dependent variables that refer to the introduction of process innovation. The structural parameters of the models were estimated using the Quasi-Newton method (with the level of significance $\alpha = 0.10$). The R^2 coefficient of determination is a statistical measure of how well the regression

predictions approximate the real data points. It can be used for linear regression models. In case of logistic regression it can be used pseudo R² measures by Cox and Snell or Nagelkerger. In logistic regression we can also present a prediction accuracy measure.

Table 4 presents 3 models of logistic regression for the dependent variable of process innovation. Model 1 is estimated on the basis of all independent variables considered in the analysis. Model 2 presents the results of estimation for significant variables only, and model 3 presents the influence of only two variables (size of the company and duration of an alliance) on the probability of introduction of a process innovation.

Table 4: Logistic regression parameters for process innovation models (N=70)

	Model 1		Model 2		exp(b)	Model 3		exp(b)
	Coeff	p-value	Coeff	p-value		Coeff	p-value	
Intercept	6.2792	0.7039	1.9636	0.4567	7.1247	-7.0609	0.0001 ***	0.0009
TR	0.0000	0.9342						
EBIT	0.0003	0.4018						
ROA	0.7218	0.8091						
BV	-0.0001	0.3610						
EMPL	0.0214	0.4471						
AGE	0.0027	0.9863						
SECTOR	-0.1428	0.5975						
SIZE	-1.6776	0.7920				2.7105	0.0025 ***	15.0361
DURATION	2.4852	0.0378 **	2.5660	0.0050 ***	13.0139	2.2097	0.0051 ***	9.1128
SIMPL	-2.3454	0.1183	-1.6760	0.0021 ***	0.1871			
TRUST	-0.4502	0.6174						
SM	0.0196	0.9849						
SET	-0.0241	0.9857						
IC	0.3909	0.5834						
CR	0.1772	0.8529						
R-Sq (L)	0.64		0.58			0.54		
R-Sq (CS)	0.53		0.50			0.48		
R-Sq (N)	0.76		0.72			0.68		
Prediction accuracy	0.90		0.91			0.89		

Signif. codes: 0 '***' 0.01 '**' 0.05 '*' 0.1 '+' 0.12 '.' 1.

Model 2 after reduction of insignificant variables presents the probability of introducing a process innovation depending on the duration of an alliance, and simplification of alliance tasks. Increasing the duration of an alliance increases the probability of introducing a process innovation by more than 13 times, while increasing a simplification of alliances tasks results in reduction of the probability by more than 81%. The final form of model 2 is expressed by the formula:

$$P(Y = 1 \mid DURATION, SIMPL) = \frac{e^{1.9693+2.5660 DURATION-1.6760 SIMPL}}{1+e^{1.9693+2.5660 DURATION-1.6760 SIMPL}} \quad (6)$$

Model 2 provides material for conclusions regarding not only the duration of an alliance, but also some features that can facilitate knowledge acquisition as a result of alliance agreement. The interpretation of this relations is presented in the discussion section.

In models 3, only two independent variables were considered: the size of the company and the duration of the alliance. For process innovation model, both independent variables (size and duration) are significant. The final forms of the logistic regression model 3 are expressed by the formula:

$$P(Y = 1 \mid SIZE, DURATION) = \frac{e^{-7.0609+2.7105 SIZE+2.2097 DURATION}}{1+e^{-7.0609+2.7105 SIZE+2.2097 DURATION}} \quad (7)$$

Increasing the size of the company, as well as extending the duration of the alliance, has a positive effect on implementation of process innovations. In fact, enlarging the size of the company increases the probability of implementation of this innovation by 15.04 times. Respectively, extension of the alliance agreement increases the probability of implementation of process innovation by 9.11 times.

Using structural parameters of logistic regression models we can calculate the probability of introducing process innovations determined by the size of an enterprise and the duration of alliance agreement. The results are presented in table 5.

Table 5: Probability of introducing process innovation according to the company size and alliance duration

		<i>Duration of alliance agreement</i>		
		up to 1 year	1-3 years	more than 3 years
<i>Company size</i>	Small	11%	52%	91%
	Medium	64%	94%	99%
	Large	96%	100%	100%

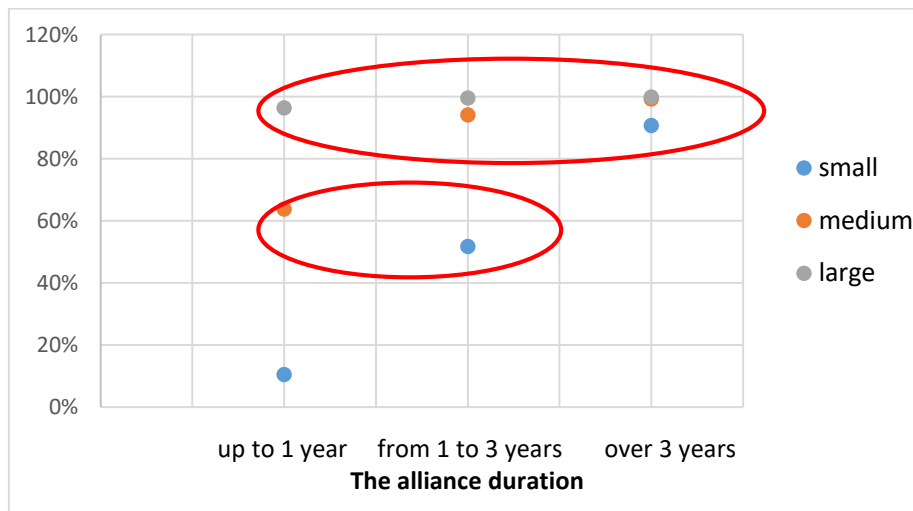
In the case of process innovations, data analysis allows the following conclusions:

- variables: employment and duration of the alliance have a positive impact on the introduction of process innovations; the recruitment of an additional employee increases the probability of introducing process innovation by 2.25%, while the extension of cooperation within the alliance increases the probability more than 8.5 times;
- variables affecting the probability of introducing process innovation were: book value, smaller employee teams, informal communication and complementary nature of resources.

Particular attention should be paid to variables related to diffusion of knowledge within the alliance, i.e. the greater the scale of the separation of smaller employee teams, the higher the incidence of informal communication and the greater the complementarity of resources, the lower the probability of introducing process innovation. However, taking into account only the impact of the size of the company and the duration of the

alliance (model 3), compared to product innovations, in the case of process innovations, the effects are even greater. Regression analysis shows that increasing the size of the company increases the probability of implementing innovations. Correspondingly, the longer duration of the alliance, the greater the probability of implementing process innovations. Graph 1 shows these relationships for process innovations. Two clear dependencies are visible:

1. Large enterprises can introduce process innovations with nearly 100% probability regardless of the duration of the alliance. The same effects may be obtained by medium-sized enterprises, but only in the situation of more than one year of cooperation within the alliance. Small enterprises can achieve similar results, but only in cooperation within the framework of an alliance lasting at least 3 years.
2. Medium-sized enterprises with a short period of cooperation within the alliance (below one year) and small enterprises with medium-term cooperation within the alliance (from one to three years) introduce process innovations with approx. 60% probability.



Graph 1: The probability of introducing process innovation depending on the size of the company and the duration of the alliance

The longer the duration of the alliance, the easier the implementation of process innovations. The analysis of the probability of introducing process innovations shows that the large enterprises can most effectively introduce them irrespective of the duration of the alliance. However, smaller ones may achieve similar results as a result by extension of the cooperation within the alliance (only if the alliance lasts at least 3 years).

Discussion and further directions of research

Intellectual assets are the driving force for innovations, and they could be obtained from the resources of a partner enterprise in a strategic alliance. In fact, strategic alliances

are essential factors driving innovations, and help partner companies get access to essential resources, broaden their technological competences and build reputation (Lee et al. 2010; Brunswicker and Vanhaverbeke 2015). Bilateral exchange of knowledge, *know-how*, technologies and modern management systems between cooperating international enterprises results in releasing improved products on the market. Knowledge management and knowledge transfer associated with it is a condition for being competitive on a global market, sometimes contributing to active influence of business entities on global economy. The influence of this process on the competitiveness of economies, in which innovative enterprises function, is also significant (Cunningham and Link 2016).

The presented research results indicate that compatible missions, visions and strategies of mutual agreement (strategic match), as well as inherence of resources (complementary resources of partner enterprises) contributed to the alliance constitute significant determinants of the knowledge management process in a strategic alliance. According to the logistic regression model 2, we can conclude that longer duration of the alliance and better strategic match determine the practices supporting mutual learning and knowledge sharing. It also promotes integration of partners and increases the probability of implementing process innovations. Additionally, simplification of alliances tasks is not a positive circumstance in developing process innovation. This kind of innovation engage much more efforts during the development, testing and final implementation of a new or significantly improved processes. Process innovations usually provide solutions to specific problems. This may require solving many more complex tasks. There are no shortcuts here, and all activities aimed at improving the process are closely related. Thus, Zhao et al. (2016) also emphasise that the knowledge flow has a positive influence on alliance innovation performance. The longer the alliance cooperation, the larger the possibilities of developing and implementing process innovation (increases the probability more than 9 times). Longer cooperation provides an opportunity to improve the product offer through process innovations aimed mainly at strengthening or gaining a competitive position and striving for business excellence. It manifests itself by autonomously strengthening the learning process and acquiring the discipline of action in the scope of further continuous development of skills and knowledge. In addition, maintaining a competitive advantage requires improving processes, entering new markets or raising barriers in current areas. In turn, the implementation of process innovations is conditioned mainly by the creation of larger employee teams, despite the still maintained low complementarity of resources and formal communication. The knowledge acquired in the alliance can induce the development of innovative process solutions than the implementation of product innovations. At the same time, the alliance between medium and large enterprises results in a much higher probability of implementing product or process innovations than in the case of small enterprises. Moreover, complementary resources owned by larger enterprises seem to be the driving force of innovation within the alliance. The knowledge is the crucial one among these resources as a basis for the development and implementation of new or significantly improved production or delivery methods, new solutions in the field of technology or software.

The presented results and conclusions have some limitations. The research was conducted among the Polish enterprises, hence the conclusions could be applied to

other countries with a similar development level and innovation potential. Among the limitations that should also be taken into account are: the degree of enterprises' involvement in knowledge management, sources of technology transfer, models and systems of knowledge management and technology transfer, public support (from government and European Union) in technology transfer processes, the degree of cooperation between enterprises, universities and research institutions. The process of knowledge diffusion and implementation of innovations largely depends on the conditions for enterprises created by state and local government authorities. Pro-innovative legal regulations encouraging enterprises to increase the R&D expenditures as well as infrastructural solutions, e.g. by creating clusters or special economic zones should be considered as positive incentives. These factors are largely dependent on the economic policy and long term development strategy.

So far, empirical studies have been insufficiently contributing to the understanding of knowledge management practices in alliances and results in the field of innovation of cooperating enterprises (Natalicchio et al. 2017). Although this knowledge is well-established, this classification applies particularly to factors affecting knowledge management. Undoubtedly, the presented research results do not exhaust the issues of knowledge management and innovation implementation by enterprises within the strategic alliance. An interesting direction of further research may be the importance of other characteristics of knowledge diffusion in alliance that differentiate between enterprises such as capital (foreign / domestic) and the geographical scope of activities (national / international). Further research should take into account other measures describing the level of innovativeness of enterprises related to the specific effects, such as cost savings or increasing market share. In addition, the fact of introducing a specific type of innovation is a relative term. The analysis ought to include more reliable variables, such as the number of obtained patents (innovation output measures).

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The Incubator and the Strategy for the Competitive Success of its Incubated Enterprises

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Abstract: In this paper we show the outcomes of an empirical study carried out in an incubator in which the competitive success of incubated enterprises was analyzed.

The incubator company, located about 20 km from Lisbon, in a Municipality with great business dynamics and with good access to neighboring Municipalities, supports more than 50 firms that are engaged in the following economic activities: Architecture, Business Association, Footwear, Management and investment consultancy, Accounting and management, Development and Scientific Systemization of innovative social responses, Design & Image, E-commerce, Social Economy, Architectural and engineering consultancy and editions, Entrepreneurship, Energy and environment, Engineering, Training, Geology, Hardware, R&D, Real estate, Research, Games, Media and communications, Medicine, Open software, Event organization, Health Services, Health support services, GIS, Software, ICT.

The research developed had as main objective to inquire and analyses the success of incubated companies in view of the implementation of new services and the improvement of the existing ones.

Companies were surveyed through a questionnaire drawn up for this purpose, previously tested and adapted to this study.

Keywords: Incubator; Incubated Enterprises; Competitive Success; Factors of Competitive Success; Business Support Office.

Resumo: Neste artigo apresentamos os resultados de um estudo empírico realizado numa incubadora em que se procedeu à análise do sucesso competitivo das empresas incubadas.

A incubadora situada a cerca de 20 km de Lisboa, num município com grande dinâmica empresarial e com ótimos acessos aos concelhos limítrofes e a Lisboa, apoia mais de

cinquenta empresas que se dedicam predominantemente às seguintes atividades: Arquitetura, Associativismo Empresarial, Calçado - design e produção, Consultoria Abrangente de Gestão e Investimentos, Contabilidade e Gestão, Desenvolvimento e sistematização científica de respostas sociais inovadoras, Design & Imagem, E-commerce, Economia Social, Edições e Consultoria em Arquitetura e Engenharia, Empreendedorismo, Energia e Ambiente, Engenharia, Formação, Geologia, Hardware, I&D, Imobiliário, Investigação, Jogos, Media e Comunicação, Mediação e Consultoria de Seguros nos ramos Vida e Não Vida, Mediação Imobiliária, Mediação de Seguros, Medicina, Open Software, Organização de Eventos, Saúde, Serviços, Serviços de apoio à saúde, SIG, Software, TIC.

A investigação desenvolvida teve como principal objetivo inquirir e analisar o sucesso competitivo das empresas incubadas tendo em vista a implementação de novos serviços na incubadora ou melhoria dos existentes de forma a contribuir para esse sucesso.

As empresas foram inquiridas mediante um questionário elaborado para o efeito e que foi previamente testado e adaptado ao presente estudo.

Palavras-Chave: Incubadoras; Empresas Incubadas; Sucesso Competitivo, Fatores de Sucesso Competitivo, Escritório de Apoio aos Negócios.

1. Introduction

The National Association of Entities Promoting Advanced Technologies in Portugal - ANPROTEC (2017) defines incubators of companies as an entity that aims to support entrepreneurs so they can develop innovative ideas and turn them into successful ventures. For this, it offers infrastructure, training and management support, guiding the entrepreneurs in terms of management, financial, legal, and other issues essential to the development of a company.

This is a study of a private company with shared physical or virtual space that is provided on favorable terms to incubated companies, with Internet and Wi-Fi support services conducive to the development of the following activities and actions: specialized and excellence in the field of corporate and social entrepreneurship; creation of business nests, incubation of startups, co working spaces, networking, corporate and social networks, business support; consulting in the area of management and marketing; preparation of applications and project management; event organization; professional internships, Ecotourism services and management of the Third Sector.

The incubator studied is an SME that essentially aims to support entrepreneurs operating in sectors of economic and social entrepreneurship. It has widely diffused technologies that aim to add value to the products, processes or services of incubated companies, by means of increasing its technological level.

As competitive factors have spaces with excellent light and physical conditions (canopy, parking and auditorium, among others); excellent geographical location, with excellent accessibility to Lisbon, Oeiras, Sasseiros, Carcavelos, Parede, Cacém, Sintra, etc. with good means of public transportation, being able to establish economies of scale and networks with the business parks, business associations and companies of the area that is characterized by strong economic activity. It has partnerships with organizations in

the areas of business, training and new technologies, among others.

The direction of the incubator and the support given is highly specialized and essentially aims to lead incubated companies to Competitive Success.

The profile of incubated or in process companies is related to diverse areas, such as: Architecture, Business association, Footwear, Management and investment consultancy, Accounting and management, Development and scientific systemization of innovative social responses, Design & Image, E-commerce, Social Economy, Architectural and engineering consultancy and editions, Entrepreneurship, Energy and environment, Engineering, Training, Geology, Hardware, R&D, Real estate, Research, Games, Media and communications, Medicine, Open software, Event organization, Health, Services, Health support services, GIS, Software, ICT.

2. Theoretical Framework

2.1 Business Incubation

2.1.1. Incubator and incubated enterprises

In the specialized literature there are different definitions of incubator companies. According to Vedovello (2000, p. 280), “there is no single definition that can be applied to all technology parks and incubator companies by virtue of the diversity and heterogeneity of their models”.

Generally, the incubators also named business nests are organizations that support the companies in its early stages of life, faced as a great promotion and economic development strategy of a region. They provide workspaces in individual offices or in co-working that include the management of mail correspondence, internet, water, electricity and cleaning services, and also business, accounting, financial and legal advisory services. Furthermore, they provide specific networking, focused in business actions in a sharing entrepreneurial environment. The monthly costs related to the surrender of space and to the supply of these services are very competitive. If an entrepreneur prefers to host his business or to work in his own home, the incubators have provided the supply of virtual offices, whose provision of services includes management of physical and virtual correspondence, as well as business advisory in its different aspects and offer spaces to hold meetings with their clients and providers.

Currently, the incubator programs keep the original three programs (technological, traditional and mixed).

2.1.2. Incubation Models

“First Generation” Incubators Generally characterized by a strong ‘real estate’ component and proximity to research institutes or technical university environments, this type of incubator is generally created by building new facilities, such as science, technology parks, or techno poles, or by readapting abandoned buildings (e.g. industrial complexes). Its real estate component often implies considerable public investments, sometimes supported by national or local programs for innovation, job creation and

economic development. Sustainability is considered a major challenge of these initiatives, which always require considerable fixed investments, have long development life-cycles and can suffer from inadequate financing and exit mechanisms for graduating companies. The most frequent “success factors” of these systems are tied to their capacity to focus on new venture creation rather than on real estate management, governance with an entrepreneurial management, and a strategic marketing orientation.

University incubators are established in or by university campuses. There are different models, sizes and nuances regarding these kinds of initiatives. The common factor is that these incubators generally promote the development of new research/technology-based firms inside their own facilities. The role played by universities consists of linking research, technology, capital and know-how to leverage entrepreneurial talent, accelerate the development of new technology-based firms, and speed up the commercialization of technology. Their success is considerably tied to the capacity of linking research with industry.

Virtual incubators are considered the “second generation” of incubators. These incubators are non-property-based ventures which require lower fixed investments and are regarded as a possible way of servicing SMEs in areas with insufficient critical mass. Virtual incubators are often hosted by a university or a research center and are characterized by their capacity to operate both within walls and outside. When they operate as “incubators without walls” they serve newly created firms without hosting them within the incubator’s facilities. They usually generate externalities among firms linked via computer and telecommunications networks. Most virtual incubators are technology oriented and are aimed at transforming research into marketable products. The offering of pre-incubation and post-incubation services are considered a natural evolution of this model.

International Enterprise Centers – International Business Incubators. This model is considered the “third generation” of incubators. These incubators provide a full range of support services for the development of knowledge-based businesses. Most of them are export-oriented and show impressive growth rates and sales records. They link universities, research institutes, venture capital and international joint ventures. (Scaramuzzi, 2002).

2.1.3. Historical aspects of the development of business incubation in Portugal

In the end of twentieth century there was a great change in the economy and labor markets in association with the globalization process and technological developments; western societies entered in a new era featured by more open markets and more unstable and competitive environment. (Held et al., 2000; Audretsch, 2010; Martins-Rodrigues, 2018).

The first model of business incubation began in 1959, in the State of New York, when a tractor factory, Massey Ferguson, closed and left a many number of workers unemployed. The factory facilities were purchased by Joseph Mancuso, who decided to subdivide it into smaller boxes and sublet them to small enterprises. Besides, the facilities had a reduced price, and the companies also shared some types of equipment

and administrative services (Kuratko and LaFollette, 1986; Ortigara et al., 2011; Martins-Rodrigues, 2018).

The conception of business incubators is based on the success reached in California, in the Silicon Valley region, from initiatives of Stanford University (Gadelha and Mâsih 2007). According to Martins-Rodrigues (2018), in the first model of business incubation, advocated by Joseph Mancuso, incubated companies were supported by physical infrastructures and also by a set of services that could be shared, namely, accounting, sales, marketing and secretarial, that allow a very sharp reduction in costs and a strong strengthening of competitiveness. At that time, the American government offered legal, administrative and technical advice to newly graduated young people to start their ventures. Referring to the system originally proposed by Joseph Mancuso, the American government called this system as business incubators (Kuratko and LaFollette, 1986).

In Portugal, the first incubators appeared in the eighties (Marques, 2009; Caetano, 2012; Martins-Rodrigues, 2018). More strictly, the first incubator appeared in 1987, named AITEC- Tecnologias de Informação (Information Technologies), SA, created by INESC (Institute of Engineering and Computer Systems), in association with IPE (State Participations Institute), located in Oporto city. It had the incentive of European Union and its objective was to create a support network to found new companies, through support and promotion of creation of enterprises linked to the university (Martins-Rodrigues, 2018).

Despite the pioneering experience of AITEC, business incubators in Portugal emerged only in the early 1990s, with EU community funds for public investment in infrastructures in Portugal.

In the first half of the 1990s, the main incubators in Portugal, belonged to the Youth Foundation, through the "Business Nests" Program started in 1990, through the NACE Program (Support Centers for Business Creation). For the most part, they were considered regional incubators for economic development, with the main objectives of creating jobs and diversifying the productive fabric.

In the second half of the 1990s, incubators associated with universities - Institute Pedro Nunes (Coimbra), University of Aveiro - and technology parks - Taguspark, Lispolis and Cintec started to operate. It is also worth mentioning the opening of the first island incubator in 1997, in Madeira Island, promoted by the Madeira Business and Innovation Center (BIC Madeira). These incubators, considered 2nd generation, seek to stimulate a more diversified offer of services to the incubated ones and privilege technology and innovation in the new business projects selected for incubation.

In a study by SPI – Portuguese Society of Innovation (2001), 31 incubators of companies were in activity in Portugal, of which 22 are defined as generalist incubators, 9 academic incubators, university-related, 5 technological incubators, 2 incubators private and 1 sector incubator.

According to data released in the "Entrepreneurship Week", held in Lisbon in May 2017, the number of these business incubators has tripled, in Lisbon, from six to 18 in the last four years, not counting the 40 co working spaces and other FabLabs (creativity labs) were created. However, the phenomenon is replicating a bit throughout the country. Until May 2018, only IAPMEI - Agency for Competitiveness and Innovation, 91 incubators

were accredited to follow the start-ups competing for the "Incubation Vouchers" and "Voucher Startup" - support granted under the national program to encourage entrepreneurship StartUP Portugal. However, according to data from the National Network of Incubators (RNI), there will be more than 130 incubators scattered throughout the country, a number that continues to increase (Madrinha, 2018).

2.2. Competitive Success

One of the objectives of the Incubators is to contribute to the Competitive Success of their incubated companies.

The Business Competitiveness can be defined as a set of actions that the entities develop in order to maximize their results, achieving the best possible return on a given investment. Companies reinforce their competitive advantages over competitors by differentiating them from competitors.

The Resource-Based View (VBR) theory has emerged as one of the most important theoretical currents of business strategy, which proposes that the internal resources of the organization are sources of competitive advantages (Wernerfelt, 1984; Barney, 1986, 1991).

In this perspective, organizations acquire competitive advantages derived from resources, understood as all assets, skills, organizational processes, information and knowledge, among other assets, controlled by a company, that enable it to design and implement strategies that increase its efficiency and effectiveness (Daft, 1999).

Also, Teece (2010) adds that globalization is a challenge that presents threats and opportunities, so companies must to seize opportunities and offer products, processes and services that are innovative. In this same perspective, with globalization, the changes in technological innovations are constant and, they exert a great influence on the competitive framework of the companies, appearing new business opportunities and making the market more dynamic and demanding (Sousa et al., 2010).

Thus, to achieve better results, companies need to find management processes and techniques that allow them to develop a more efficient management. A business incubator emerges to fill this need, which is one of the actors in the current development, with the objective of developing and supporting nascent companies by improving management and technology tools, as a facilitator of information and services and fostering entrepreneurship, incubated companies, increasing the chances of success to become more competitive (Martins-Rodrigues, 2017).

Most of the concepts of Competitive Success that have been proposed in the literature have in common to define competitiveness as the ability to generate sustainable competitive advantages when producing goods and services in relation to other competing companies. In this perspective, Competitive Success is defined as the ability, in competition with other companies in the same sector of activity, to achieve a very favorable competitive position, with good results and in a sustainable way over time (Aragón and Rubio, 2005); (Achanga et al., 2006) and (Bañon and Sanchez, 2007).

Competitive Success is a very dynamic concept that changes over time, because some factors are inactive today, but they have played a relevant role in the past, and others

arise as a result of globalization and business dynamics (Estrada et al. 2009).

Other authors mention that a company has competitive success if, in competition with others, its market position is increased, it reaches a more favorable position, and achieves superior results without resorting to excessively low remuneration of its factors of production (Gallardo-Vázquez et al., 2013).

According to Bontis et al. (1999), the companies that make better use of human resources and in a more dynamic way than their competitors are the ones that achieve success more quickly. Thus, companies should invest more in human resources because they are those who have the capacity to create and innovate through their know-how and training generating value for the company.

According to Hitt et al. (2008) when an organization is able to formulate and implement a value-generating strategy, it is successful in terms of competitiveness. When other companies fail to replicate the paths that led to this winning strategy, there is easily the building of a sustainable competitive advantage, often referred to only as a competitive advantage.

According to Umemoto (2002), the currently competitive factors, such as globalization, easy accessibility and dissemination of new technologies, rapid technological development and shortening of product life cycles, are a constant and explain the need to evaluate, measure and manage human resources in companies.

3. Methodology

The methodology used was the case study, the data were collected through questionnaires. The study was developed through the preparation and administration of an *ad hoc* questionnaire prepared by the researchers from the academic literature consulted.

The questionnaire was sent to the entire population census, 50 companies incubated from the incubator under study. The companies were contacted by phone, e-mail and even in person in order to get the most responses. Finally, we finished the field work with 36 valid questionnaires, which presupposes some 71 percent of the study population.

3.1. Analysis and Discussion of Results

The main objective of the research was to identify the sources of competitive advantages of the Incubator, located about 20 km from Lisbon, in a municipality with great dynamics, one of the most important in the country, that in the light of the resource-based view, according to Barney et al. (2001) is perhaps the most preponderant approach to understanding strategic management.

In the analysis of the data, several resources emerged as important for the incubator under analysis, but five of them highlighted the Physical Location and Infrastructure, Planning and Management, Incubator Marketing, Company Selection Process and Incubator Human Resources. (In table 1, a summary of the analysis of each of the resources with respect to the cited criteria) is presented.

The companies that answered the questionnaire, 90% started the activity in the present decade; the following sectors of activity are involved: Architecture, Business Associations, Footwear - design and production, Comprehensive Management and Investment Consulting, Accounting and Management, Development and scientific systematization of innovative social responses., Design & Image, E- commerce, Social Economy, Editions and Consulting in Architecture and Engineering, Entrepreneurship, Energy and Environment, Engineering, Training, Geology, Hardware, R & D, Real Estate, Research, Games, Media and Communication, Mediation and Insurance Consulting in the branches Life and Non-Life, Real Estate Mediation, Insurance Mediation, Medicine, Open Software, Event organization, Health, Services, Health services, GIS, Software, ICT; being the main reasons that motivated them to look for the incubator of companies essentially its location, followed by lower costs, and also by the business contacts.

The type of contract they made with the incubator was Independent Office, Virtual Office and Co work.

As for the competitive success with regard to the various factors that contribute to the success of incubated, several aspects were considered (Table 2):

Location and physical infrastructure, 80% of companies consider the quality of the facilities and the adequacy of the location to be very important or important, and 90% indicate that they are close to one of the main universities. Regarding the physical space, 70% consider it very important or important to have rooms with modular spaces, which may be adapted to the needs of the entrepreneurs.

Regarding planning and management, 80% of companies consider, regarding the company, the levels of organizational quality and administrative management are very important or important; 80% the existence of technological resources and information systems; 70% the level of cohesion of values and corporate culture; 90% the fact that the company is managed as a business, follow an annual plan and seek mechanisms for self-sustainability; 90% the fact that the company's business plan is periodically evaluated and updated and 90% the level of market knowledge, know-how and accumulated experience.

In relation to the offer of specialized services by the incubator, 60% consider it very important or important for the incubator to provide support and financial advisory services; 80% offer "personalized" service programs and services relative to business needs; 70% have a business support office.

In terms of the network, 80% consider it very important or important that the incubator promote through networking cooperation networks with other companies and institutions and 70% work with incubator networks and in line with the local development plan.

Regarding incubator marketing, 80% of the incubators state that it is very important or important to use Marketing actions to implement the investment and to boost successful companies; 70% affirm that it is very important or important that the incubator's marketing area be dynamic in order to attract solid companies; and 80% say it is important or very important that the incubator holds promotional material such as flyers, website and social networks.

For entrepreneurship 70% of incubated respondents consider it very important or important that the incubator encourages entrepreneurship within educational institutions by conducting lectures and expositions on the subject and 70% that the incubator promotes student visits to the incubator with the purpose of encouraging the creation of new business.

As for the selection process of the companies, 80% consider it very important or important that the incubator is demanding in the process of selection of the incubated and 60% that the candidate companies are evaluated, mainly technological innovation and market viability through a business plan.

Regarding the human resources of the incubator, 80% consider the quality of the incubator's human resources to be very important or important, and 80% the training and qualification levels of the incubator employees.

4. Conclusion

The results of the analysis of the companies' responses to the questionnaire indicate that the great majority of incubated companies recognize that the adequacy of physical space and location as well as efficient planning and management is very important or important for competitive success. Concerning the contribution of incubators to the companies' competitive success, they consider the provision of specialized and "personalized" services to be very important or important, through adequate human and technological resources and adequate selection of the incubated companies. The establishment of network with other companies and institutions is also considered very important or important. Marketing and promoting entrepreneurship are also considered very important or important by most companies.

The fact that some companies do not attach importance to some of the aforementioned aspects leads to the need to conduct interviews with the managers / directors of the same, whose results will be presented in due course.

As limitations of the research, the research restrictions that in this case specifically concern an incubator can be pointed out. In any case, the results allow us to understand how a private incubator can become and remain in a prominent position in the national scenario.

As future work, the authors suggest a deeper analysis of each of the sources of competitive advantages, as well as similar research in other incubators of prominent companies, particularly in the district of Lisbon.

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Annex 1

Table 1 – Resources of the incubator and their characteristics

RESOURCES	CHARACTERISTICS
Location and physical infrastructure	<p>Quality of facilities and location appropriate to the needs of the company.</p> <p>Location close to one of the main universities.</p> <p>Presentation of rooms with modular spaces, which can be adapted to the needs of the entrepreneurs.</p>
Planning and management	<p>Levels of organizational and management quality of the company.</p> <p>Technology resources and information systems of the company.</p> <p>Level of cohesion of values and corporate culture of the company.</p> <p>The company is run as a business, following an annual plan and seeks mechanisms for self-sustainability.</p> <p>Business plan of the company is evaluated and updated periodically.</p> <p>Level of market knowledge, Know How and accumulated experience of the company.</p>
Offer of specialized services	<p>Provision of support and financial advisory services.</p> <p>Offering programs and services that meet "Personalized" the needs of your company.</p> <p>Existence of an office to support the entrepreneur.</p>
Network	<p>Promotion through network networks of cooperation with other companies and institutions.</p> <p>Working with networks of incubators and in line with the local development plan.</p>
Incubator Marketing	<p>Use of Marketing actions to implement the investment and energize successful companies.</p> <p>The incubator's marketing area is dynamic in the sense to attract solid companies.</p> <p>Existence of promotional material such as flyers, website at internet and social networks.</p>
Entrepreneurship	<p>Incentives for entrepreneurship within institutions lectures and exhibitions about the theme.</p> <p>Promotion of student visits to the incubator with the purpose of encouraging the creation of new businesses</p> <p>Process of selection of companies Requirement in the selection process.</p> <p>Evaluation of candidates for technological innovation and market viability through a business.</p>
Selection process of companies	<p>Requirement in the selection process.</p> <p>Evaluation of candidates for technological innovation and market viability through a business.</p>
Human resources of the incubator	<p>Quality of the human resources of the incubator. Levels of training of incubator collaborators.</p>

Annex 2

Table 2 – Questionnaire results

Surveyed aspects	Characteristics
1. Characteristics of incubated companies Start of activity; sectors of activity; reasons that motivated them to look for the incubator and type of contract that they made with the incubator.	
2. Competitive success As for the competitive success about the various factors that contribute to the success of incubated, several aspects were surveyed.	
2.1. Location and physical infrastructure.	80% of the companies consider the quality of the facilities and the adequacy of the location to be very important or important; 90% indicate that they are close to one of the main universities. Regarding the physical space; 70% consider it very important or important to have rooms with modular spaces, which may be adapted to the needs of the entrepreneurs.
2.2. Planning and management	80% of companies consider levels of organizational quality and administrative management to be very important or important; 80% the existence of technological resources and information systems; 70% the level of cohesion of values and corporate culture; 90% the fact that the company is managed as a business, follow an annual plan and seek mechanisms for self-sustainability; 90% the fact that the company's business plan is periodically evaluated and updated; 90% the level of market knowledge, know-how and accumulated experience.
2.3. Offer of specialized services	60% consider it very important or important for the incubator to provide support and financial advisory services; 80% offer "personalized" service programs and services relative to business needs; 70% have a business support office.
2.4. Network of relationships	80% consider it very important or important for the incubator to promote through networking cooperation networks with other companies and institutions; 70% to work with incubator networks and in line with the local development plan.
2.5. Incubator Marketing	80% of the incubated state that it is very important or important to use Marketing actions to implement the investment and to energize successful companies; 70% affirm that it is very important or important that the incubator's marketing area be dynamic in order to attract solid companies; 80% holding promotional material such as flyers, website and social networks.
2.6. Entrepreneurship	70% of incubated respondents consider it very important

	<p>or important that the incubator encourages entrepreneurship within educational institutions by holding lectures and exhibitions on the subject;</p> <p>70% that the incubator promotes student visits to the incubator with the purpose of encouraging the creation of new businesses.</p>
2.7. Process of selection of companies	<p>80% consider it very important or important that the incubator is demanding in the incubation selection process;</p> <p>60% that the candidate companies are evaluated mainly for technological innovation and market viability through a business plan.</p>
2.8. Human resources of the incubator	<p>80% consider the quality of the incubator's human resources to be very important or important;</p> <p>80% the training and qualification levels of incubator employees.</p>

Knowledge Change Innovation

Preserving tacit knowledge into public organizations

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Abstract: Knowledge Management (KM) has been used by the organizations as a tool to organize the knowledge produced by social actors in order to preserve organizational knowledge. However, KM methodologies, usually supported by technologies, do not help organizations to treat tacit knowledge in a systematic way. The goal of this research is to identify and preserve tacit knowledge of employees with more experience in order to create and maintain organizational knowledge. A case study was undertaken within a public research and education organization in Brazil. Using the fundamentals of Grounded Theory, activity analysis and self-confrontation techniques the task of calculation of quarterly GDP was analyzed, in order to identify which activities are involved in tacit abilities. The results show that it is possible to make the server realizes about his tacit abilities and judgments required to the calculation of quarterly GDP. Later, these outcomes can be use as the basis to improve the effectiveness of the training of novices, reducing the time of apprenticeship in a specific activity that need to be preserved.

Keywords: Tacit knowledge. Tacit knowledge management. Preserving knowledge. Public sector. Expertise.

1 Introduction

The public sector has been experiencing important changes due to the changes of the society itself that have been demanding an increase of efficiency and improvement of the services offered by the public institutions (Coelho 2004; Batista et al. 2005; Fresneda and Gonçalves 2007; Bolliger 2014). Such changes require the implementation of a "set of strategies and tactics that try to improve the capacity of government agencies and their collaborators, private and third sector, to produce results through the reinvention of government" (Homburg 2004).

To achieve these objectives, the public sector has been using the information and communication technologies. These technologies have already shown their ability in terms of the effectively control of structured information, particularly in central governments and economic aspects, thus constituting the so-called electronic government.

The initiative of knowledge management (KM), especially in the field of Information Science, has been adopted another approach that concerns with the preservation of knowledge produced over time in institutions. However, within the literature of this area, there is an

emphasis on the studies that deal with structured, formalized, and reified knowledge, while the tacit knowledge, which is developed by the experience of individuals in a specific context, is neglected.

Based on this gap in the literature, this article proposes a case study about the tacit knowledge management in a public research and education institution in Brazil. The research is the result of a PhD study, presented in 2017, and developed at School of Information Science at Federal University of Minas Gerais.

This case study was conducted in an organization where several servers were already able to retire (a condition that is common in many public institutions in Brazil). This research aims to identify the possibility of implementation of tacit knowledge management actions in a public organization. The goal of this study is to find ways to develop tacit skills in the scope of servers with less experience, allowing the organization's expertise to be minimally preserved and enabling the continuity of service provision, even though the servers with more experience were leaving.

In order to achieve this goal, the task of GDP quarterly calculation of Minas Gerais was selected and analyzed. This is considered a structured and routine task that supposedly could be performed automatically. Based on Grounded Theory fundamentals (Glaser and Strauss, 1967), the technique of observing server activity was applied to monitor the performance of the task during three consecutive quarters. Moreover, in-depth semi-structured interviews were conducted individually with eight servers, who were responsible for GDP calculation. Finally, the self-confrontation technique was used, with a recurring return to the data collected. These data were analyzed and categorized in order to explain the abilities incorporated throughout the experience of each individual immersed in the task.

2 The management of tacit knowledge

The need to create a competitive advantage in the globalized market has been provoked in organizations the permanent search for new knowledge. Authors like Choo (1998), Davenport and Prusak (1998), Stewart (1998), Edvinsson and Malone (1998), Leonard-Barton (1998) highlight the importance of knowledge as a strategic resource for companies, as a way to survive and prosper. Thus, knowledge management has been consolidated as an essential practice for organizations in relation to the management of information and intangible assets (patents, trademarks, intellectual property, and knowledge) (Stewart 1998).

2.1 Conceptual question

However, firstly, a conceptual question about the meanings of "information" and "knowledge" must be explained, since the conceptualization of these terms never reached a consensus in the studies of Information Science (Alvarenga-Neto 2005).

In order to discuss the concepts of data, information, and knowledge, we can draw on the perspective of Davenport (1998). He understands "data" as raw facts, without specific context. According to him, "data" represents elemental description of things, events, or activities in the world. Thus, it can be structured, transferred, and manipulated by machines. This author also states that "information" represents data that were collected, organized, ordered. "Information" assigns meaning and context, hereby it acquires an additional value, besides

the data itself. In other words, when data receives different attributes, it becomes different information. Finally, Davenport (1998) argues that “knowledge” is “the valuable information in human mind”. It includes reflection, synthesis, context, and is difficult to be captured by machines and to be transferred to another individual, because it is unspoken.

In relation to the concept of “knowledge”, Sveiby (1998) points out that knowledge is the ability to act, inferring that it is near or leads to action. Moreover, Dixon (2000) states that knowledge is the meaningful connections that people construct in their minds between information and its application in a given context. These authors, therefore, affirm that knowledge represents the sum of a person's experiences and it only exists in human mind.

Making a counterpoint to the terminology adopted by knowledge management, Ribeiro (2013) emphasizes that the term “explicit knowledge” becomes improper when it refers to knowledge. This author argues that the resources used to structuring and disseminating this “knowledge”, such as books, manuals, standards, machines, instructions and others are neither explicit knowledge nor “types of knowledge” but “knowledge products”. He affirms: “It is a proposal to replace the (easy) use of “explicit knowledge” for questions about the reification of knowledge, learning and immersion in a way of life” (Ribeiro 2013).

Thereby, it is necessary to differentiate which knowledge management the literature is dealing with. The “knowledge” that has been externalized in some way (object, document, equipment, program), made explicit and available for others to interpret and use it is named “information management” or “reified knowledge management”. On the other hand, the “knowledge” that is inside people’s mind and is developed by practical experience in a given activity, and this experience gives the individual the ability to produce satisfactory results and differentiates them during the execution of an organizational process that can be applied in some action is called “tacit knowledge management”.

In this sense, we understand that the way to minimize the loss of an organization's expertise is to exploit the individual's experience in carrying out the activities at work, even though there is an avalanche of technological resources available to manage the knowledge reified.

Several studies such as Daniellou et al., 1989 and Duraffourg 2013 agree that organizations failed when they tried to introduce, even with the most modern technologies, some kind of automation of tasks, without concern about the “know-how” (*savoir-faire*) of the workers or performers of the activity.

Therefore, it is necessary to consider how real work indeed occurs because it is through him that know-how develops. So “know-how” should be preserved, so that it can be developed and improved by the new generations of employees who come to organizations. Otherwise, many tasks could be automated or performed by computers or autonomous devices.

2.2 Tacit knowledge

To name the knowledge that is constructed through experiences, Michel Polanyi (1958) coined the terminology “tacit knowledge”. Then, authors in the area of Information Science have systematically used this term (Grant 2007).

According to Marciano (2006), knowledge reflects the interaction of the individual with the environment. The individual's perception of himself and the world is clearly an informational

phenomenon. In so doing, the individual is influencing and being influenced by the context where he is inserted.

Previously, Maturana (1987) presents this view when he argued about the structural variation of the individual who belongs to a context and the individual who operates in a way that is appropriate to his circumstances. According to this author, the individual "can go through a continuum of structural changes in which he continues to act appropriately in his environment, even though the environment is changing." This process is called learning (Maturana 1987).

Gorman (2002), in turn, points out that the effectiveness of the transfer of tacit knowledge is related to the environment in which the interactions occur. This author affirms that in modern science, the transfer of knowledge can not happen only through documents. The interaction of the individual with the environment, in specific contexts, becomes fundamental for the construction of tacit knowledge (Gorman 2002).

Leonard and Sensiper (1998) also highlight the importance of the individual's experience to the advancement of the organization. They state that knowledge is a relevant information that is subjective and based on tacit elements that came through with experience. The combination of different experiences, points of view, and associations of different "life forms" in a particular context may enable the introduction of new ways of doing, relating, creating, and building new knowledge.

Polanyi (1958) declares that "we know more than we can say" (Polanyi 1958). Following this statement, Ribeiro (2013) notes that it is a type of (tacit) knowledge, which is "developed by experiences of individuals throughout their lives. Moreover, this (tacit) knowledge is difficult, and sometimes, impossible to transmit through manuals or instructions" (Ribeiro 2013).

From this perspective, this author deals with two approaches about tacit knowledge and explicit knowledge. The first approach considers tacit knowledge as the opposite of explicit knowledge. The former is presented as the knowledge that can be formalized through written language, mathematical expression, and manuals (Nonaka and Takeuchi 1997). On the other hand, the second approach perceives tacit and explicit knowledge as complementary, even "the most explicit knowledge is supported by tacit knowledge" (Tsoukas 2005), in other words, every explicit knowledge needs a tacit knowledge to be assimilated.

Cook and Brown (1999), in turn, expose another way of understanding the nature of knowledge when they affirm the existence of two currents. One current, "epistemology of possession", treats knowledge as something that people possess. This perspective tends to give greater importance to explicit knowledge. The other current, "epistemology of practice," is recognized to conceive "knowing as action" and knowledge is understood to be the property of a social group.

In relation to the current of the epistemology of practice, Ribeiro (2013) states that knowledge is socially agreed, modified and transmitted; it requires an "immersion" to be developed; it has "borders" that define who is inside and who is outside, who is a member and who is not, who was socialized within it and who was not. Knowledge is also controlled by rules, dated and situated: perceiving, seeing and doing things "in the same way" (Wittgenstein 1976) or "in an appropriate way" is the result of a social

agreement – being tacit or not – changes according to circumstances and over time (Ribeiro 2013).

This approach is based on the study of Wittgenstein (1999) in which he discusses that "the essence of tacit knowledge lies in the ability to participate fully in a *way of life*," what Collins (2007) called "collective tacit knowledge". This type of tacit knowledge is related to the abilities that are developed throughout the understanding of social contexts, allowing the individual to act based on what is considered a "proper way" to act in community.

Beyond this tacit knowledge, Ribeiro (2013) presents two other types. The first one is named "somatic tacit knowledge", it is responsible to characterize the individual's physical and sensory abilities. This author uses the skills developed by the human being in order to ride a bicycle (Ribeiro 2013) as an example for this type of knowledge. The second one is called "contingent tacit knowledge", it includes the types of knowledge that are "embedded in the practices of a way of life, but are in principle codable" (Ribeiro 2007). This type of tacit knowledge consists of a set of cases that can be distinguish from each other according to their level of tacitity. In other words, it depends of the awareness presented by the members of a community about the level of tacit required to perform a task. To exemplify this type of knowledge, this author cites those people who do not realize their knowledge, they are recognized for doing something that works or they are aware of owning it, but they prefer to keep this knowledge for themselves (Ribeiro 2013).

It is important to mention that the present study sought to understand the concept of tacit knowledge based on two foundations: synchronization and perception. According to Merleau-Ponty (1999), perception develops when the individual is synchronized with the world. To illustrate these concepts, the author told an experience of a child. The light of a lighted candle has its modified appearance for the child when, after being drawn and having his hand burned by the flame, it (the candle) is no longer an attraction to the child. Thus, the "facts" of the world have no meaning until the time of its exploitation.

Finally, Ribeiro (2013) states that tacit knowledge also develops through the individual's ability to make judgments, associating elements provided by the environment and previous actions, and adequately following the rules established by the context. In other words, judging is to attribute value, regarding the current social conventions and the aspects that are perceived from medium and ongoing action. Making judgments, therefore, is strongly dependent on an understanding of the social context and socially educated attention. The human capacity to judge correctly, based on the fusion of tacit and collective tacit knowledge, is one of the best examples to recognize one's expertise in a particular domain (Silva 2012).

2.3 Learning

In order to comprehend the learning process of an individual, the present research has resorted two theoretical currents: cognitivism and situated action. The debate between these currents reinforces the differentiation among the processes of learning and supports the distinction between the two types of knowledge management: reified and tacit.

Cognitivism understands that the process of learning occurs through the transmission of rules and formulas. It is based on the assumption that individuals rely on representations (cognitive models) that guide the actions in the development of activities. The authors who deal with

this current, such as Vera and Simon (1993), Piaget (1976), comprehend that individuals use previously designed schemes to be able to do something.

Vera and Simon (1993) argue that cognition is a system of logical treatment of mental representations. To the individual be considered competent, mental representations that mirror the world are enough to guide the actions.

According to Antipoff (2014), "Cognitive Sciences are centered on the computational model of the mind", and this model supports the studies in the areas of human sciences. This author also reinforces that "these sciences were interested in understanding not only the human action but also the human mind and its relation to the body" (Antipoff 2014).

Antipoff (2014) still claims that the process of learning in cognitive theory means developing a rule to act, i.e., organizing the experience in particular ways to display a correct response in a given situation." In this sense, the process of learning is "mediated by cognitive processes such as memory, language, thought, inference, deduction, and problem solving" (Antipoff 2014).

The second theoretical current, the situated action, is based on the doing and practical action in specific social contexts. Researchers of this theory, such as Lave (1988), Suchman (1987) and Theureau (2014), affirm that knowledge develops through practice, that is, the situated action allows the individual to develop the tacit abilities according to the context in which the individual acts, and hence the action is performed in a certain "way of life".

Lave (1988); Suchman (1987) and Theureau (2014) not discuss the relation between practice and representations as a causal relation (representations as cause of action). According to them, this relation is seen as a resource of practice.

Suchman (1987) highlights the influence of the immediate circumstances on the action of activity. In order to explain the role of planning, this author presents an example of a canoe worker descending the currents of a river. Suchman (1987) says that when an individual is in the current of the river, he leaves aside the plans that were previously elaborated to put into practice the corporal abilities to handle the situation. In that case, if this individual perceives the circumstances that arise along the way and knows how to use the built-in abilities, the descent of the river will be a successful. Thus, the outcome of the action is linked to the ability to use such skills (know-how) in real situations.

Suchman (1987) also asserts that predictions, schedules, and anticipations are not the determinants of action - "plans do not control action" (Suchman 1987). Individuals create representations as resources that are consulted before and after the action.

This theoretical current, situated action, postulates that the improvement in the performance of the activity tends to evolve while the interaction with the use of the corporal abilities takes place, and the previous mental representations work as support for the action, not as cause. In relation to this perspective, Antipoff (2014) reinforces that

the perspective of the situated action recognizes the existence of knowledge that was constructed by the individual, and this knowledge functions as a resource of action. It enables the comparison of the cognitive perspective with behaviorism. However, cognitivism is different from behaviorism in relation to the status of knowledge and practice. In situated action, instead of conscious

prior plans that determine each step of the execution, as a prescribed procedure in Taylorist style, these plans are resources of the action, they were incorporated in the abilities applied throughout the activity. Action is endowed with knowledge, but it is implicitly and not consciously, it emerges in situation. Nevertheless, disregarding the course of action, knowledge can be accessed in a conscious and verbal way, as an artifact of reasoning (representation) (Antipoff 2014).

And the author complements:

To cognitivists, to be intelligent is to present representations about outer reality. On the other hand, to situated action, the intelligent action is to act based on the present moment, letting embedded abilities emerge in the situation. *Since the plans, as predictions, are not enough for the variability of situations, it is the action incorporated and located, the privileged locus of an intelligent and effective action* (Antipoff 2014).

Regarding the author's argument mentioned above, it is possible to argue that cognitivism deals with representations that are developed before the action and function as generators of action. Effective practice, in turn, is guided by representations about the situation: "Only the action that is associated with knowledge can be an intelligent and well-adapted action in the medium. Otherwise, it is conditioned and acts by trial and error" (Antipoff 2014).

3 Case study

To the present research, the organization selected is a government agency of Minas Gerais/Brazil. It is an organization that maintains a School of Public Administration, and is responsible for the production of official statistics and studies of public policies. Within this organization, 112 servers were selected to compose the sample of the present study. These servers were involved with research and educational activities.

Like other public administration structures in the country, the selected organization faces many problems, such as difficulty of administering the workforce due to the rotation of governments, low salaries compared to the private sector, lack of incentives in relation to career development, legal restrictions, and several servers that are able to retire. (In 2018, the selected organization had a percentage of 38.5% of the servers that are able to retire).

In this case study, there was a task that should be performed by the selected group of servers. This task required the GDP calculation. It is divided into three calculation methods: GDP of the State, GDP of municipalities and quarterly GDP. Two servers, who individually executed the task and every procedures, perform this last one (used in the analysis of the present research) and then together they verified the results. If the servers faced any difference in the results, they need to find the reason of this difference and perform the required alterations. It is important to mention that the task of calculating GDP was chosen, because it is a relevant action to the selected organization, considering that it is an action governed by law and is responsibility of this organization to send this information to the government.

In relation to the specific calculation of quarterly GDP, the data available in databases of other agencies are collected, the calculations of each economy segment are performed and organized into three groups: industrial production, agriculture, and services. Once the index variations are identified, the seasonal alteration is made in relation to the previous quarter and the results are spread.

3.1 Tacit skills in the calculation

In the first interactions, meetings and interviews, with the group of servers responsible for calculating the quarterly GDP, some unspoken skills were observed. Even though the assignments were defined within the group, in the meetings the servers exchanged experiences. To exemplify this fact, one of the servers attempted to define which database is most suitable to use in the calculations of a certain economy segment. He showed his point of view and explained the reasons of his choice to the group. After discussions, the group's coordinator, who had more than ten years of experience in that task, pointed out the most appropriate choice and discussed the motives. Hence, it was possible to observe the different levels of expertise in relation to the amount of experience of the servers in this activity.

The second stage of the present research was the observation of the activity, that is, the monitoring of the server when he was calculating the quarterly GDP. The narrative of each server was recorded during this stage, and on average, each quarterly calculation was performed during eight days of work.

Then, these recordings were transcribed and analyzed. This analysis consists of highlighting excerpts from the narrative that could indicate signs of tacit ability, that is, something that was not formally written in the calculation, but was performed by the server. Based on this

analysis, the categories of analysis, as recommended by Grounded Theory (Glaser and Strauss 1967), were created.

Regarding the self-confrontation technique, these excerpts were shown to the server by questioning, such as: why he made certain action, how he perceived a different value, how he perceived significant variations, among others. This technique deals with recursive interviews that try to deepen the understanding of how the individual acts, perceives and uses the skills to achieve the goals in a real activity (Theureau 2014).

At stage of data collection, one of the observed servers stated that the phase of collecting data is "too mechanical" and anyone could do it. And when he was questioned whether anyone could do it, he said:

Yes. Once a person has an experience with the formula, a little knowledge of statistics, knows how to run the seasonal alteration and has a little knowledge of economics, I think it is easy to do. (Participant P93).

Even the server affirming that was a repetitive activity, when he was questioned about it, he realized that the task was not too simple as he said before. He started to realize the relevance and the specificities of the activity itself when he mentions the required skills that only people that are part of a "way of life" would be able to deal with.

In a second moment, another server was questioned about the importance of the experience to accomplish the task, and he affirms:

Once a person has more experience in projects related to the calculation of GDP, he can perceive a data discontinuity; he can perceive some inconsistency that has been generated there [the calculation]. This expertise of each individual to perceive through the number demonstrates the reality. (Participant P34).

This statement about the ability to perceive through numbers the reality translates the meaning of tacit knowledge. In other words, the participant is pointing that to calculate the variation of GDP, the individual not only follows predetermined rules and puts into practice elaborated mental representations to get a level. If this were so, any external change, in the context or in the procedures, would require a new sequence of actions to reach the result.

Certainly, when taking action, there is a need of reflection on the process itself, but when the ability responds intuitively, without an early preparation to act (Dreyfus and Dreyfus 1986), it is possible to perceive the expertise of the individual in the execution of the task.

Another excerpt of the self-confrontation phase emphasizes the process of reflection that the server develops with himself. When he was questioned about how to avoid errors in the calculation, he explains:

Big variations, I always suspect. If you have a variation ... Then you will ask me: what are "big variations"? I do not know ... [laughs] I do not know how to answer, but when I identify a very unusual variation in the economy segment, then I will figure out the reason (Participant P93).

This individual (P93) has been immersed in the calculation task for more than five years, while the previous one (P34) has only one year of experience in the task. Concerning these individuals, it is possible to perceive significant differences in the way of performing the

activity, which corroborates the literature. This amount of immersion also enables the development of perception, the capacity to make judgments and to construct meaning considering the interaction with the data.

It is important to explain that the task requires involvement. The synchronization (Merleau-Ponty 1999) of the individual with the specific context is essential to achieve an adequate result. Hence, this individual will be able to develop skills, which are not understood in the formal process of learning or prescribed rules of the task. He will develop those skills through the immersion (Ribeiro 2013) in the real work (Daniellou et al., 1989).

Regarding every questioning, it was possible to identify tacit abilities to group three types of judgments: relevance or irrelevance, similarity or difference and risk or opportunity.

Beyond these abilities, differences were also observed in the individuals' ability to perceive relevant elements in the perceptual scene. The time and the amount of immersion of each server in the task influenced the results of the work entailing variation in the time of execution.

4 Results

The aim of this study was to discuss the importance of tacit knowledge for organizations, especially those in the public sector. The case study was designed to investigate ways to preserve this type of knowledge in organizations. Thus, regarding this particular environment, where many servers are able to retire, a structured task was selected for analysis for this case study.

Over this task, it was possible to identify how the servers dealt with their unspoken abilities to perform the task, that is, everything that is done beyond what is written in the task. Hence, the authors tried to see the "world" of GDP calculation through servers's eyes when they took part of the technique of activity analysis and the self-confrontation.

Throughout the self-confrontation phase, the server could realize the importance of the activity that he was performing. Moreover, he started to identify the unspoken skills that were present in the task, and he started to realize that to accomplish the task in an adequate way, a certain level of immersion in the context of the task was required, beyond the formal knowledge.

The self-confronted server, therefore, can develop a focused training to people with less experience in that context, helping the apprentice to develop the perception and improve his attention, so the amount of time spent in the learning process will be decreasing. Thus, the organization can aspire gains in the development of servers who are novice or less experienced in the sense of having an empowered workforce while the unspoken skills are also preserved.

Finally, regarding the variations of the environment and the factors that are part of the organizational processes, it is possible to state that the productive capacity of organizations is largely derived from the tacit knowledge developed over time by their professionals. The expertise of each collaborator makes the organization capable to develop its own business. Thereby each expertise must be identified, preserved and disseminated, so the organizations can thrive with this knowledge.

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Knowledge Loss in Organizations

Enabling Knowledge Management in Complex Industrial Processes Using Semantic Web Technology

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Abstract: Complex industrial processes produce a multitude of information during the product/service lifecycle. Those data are often stored, but rarely used in the context of overall process optimization, due to their unstructured format and the inability to integrate them with stored formal knowledge about the domain. This paper proposes a way to mitigate this problem, by extending the standard SPARQL query language to enable the integration of formal knowledge and unstructured data, as well as their joint processing. The paper constitutes an initial definition of the proposed SPARQL extension and demonstrates its applicability in the context of selected examples.

Keywords: knowledge management, semantic web, metadata, SPARQL

1 Introduction

Whether they are manufacturing physical products or delivering virtual services, corporations engage in a wide variety of processes that are interrelated within and across different phases along the product/service lifecycle. In addition to achieving the core functional purpose within each step along the lifecycle (e.g., manufacturing, testing, maintenance, etc.), each process yields information about the product as well as about the process itself. There are countless examples of such information such as: data about the *quality* of the manufactured product in various production stages; data about planned, scheduled, and executed *testing* procedures; performance/measurement data of the machines involved in the production process; etc. Corporations have started to collect and store this information to improve their processes, as they are expecting that the collected data might enable them to extract valuable insights

about the product and the production process, thus enabling them to improve individual process steps or individualizing the product/service for customers.

Recently a number of data-based approaches for industrial processes monitoring have been brought forward. These approaches use different methods for managing and post-processing process data (e.g., Manabu and Yoshiaki 2008; Zhiqiang et al. 2013). This article proposes a novel approach to link (and thus utilize unstructured) process data generated within the product/service lifecycle with structured process information. This is achieved by utilizing semantic web technologies, in particular ontologies, by focusing on one important challenge in the context of complex industrial processes: the development of methods that enable the *simultaneous processing and exploitation of structured and unstructured data*. To this end, a solution to bridge the gap between the two types of data is proposed.

In order to manage structured, semantically enriched data, the Resource Description Framework (RDF; Brickley and Guha 2014) is used. RDF is a specification by the World Wide Web Consortium (W3C), for the standardization of Semantic Web technologies. Within RDF, relationships between objects (henceforth “resources”) are described using <subject - predicate - object> triples, with the predicate constituting the relationship between a subject and an object (e.g., “Apple is a Fruit”). Triples can be combined into directed RDF graphs which can be queried via query languages such as SPARQL (Prud'hommeaux et al. 2013) to retrieve context information.

Although RDF is very convenient for storing structured data, it is not appropriate for storing unstructured product lifecycle data (Hu et al. 2016; Cudré-Mauroux et al. 2013). This is due to the fact that in addition to containing large amounts of data (such as time series), unstructured data (as their name suggests) do not follow any explicit standard data models. Storing and querying such data with standard tools in the semantic technologies domain (such as RDF and SPARQL) is very inefficient and does not scale (Bornea et al. 2013). At the same time however, the very nature of these data suggests that individual values do not provide much information, but make sense (and could add value to the overall process) only if viewed in context with other values (e.g., parameters of another involved machine that were recorded at the same time period).

To link structured and unstructured data here an extension of the SPARQL query language is proposed. This extension includes several new operators, which integrate querying for structured and unstructured data into SPARQL. To accomplish this, we make use of another method from the Semantic Web domain: Linked Data (Bizer et al. 2008), i.e., a way of publishing data so that it can be easily interlinked. The idea is to store unstructured data so that they can be accessed through a Web service and to store only a link to that service inside the RDF graph. New SPARQL operators then enable retrieving unstructured data from a given link and processing retrieved results in an enclosing SPARQL query/queries. This allows to host each data within its respective habitat (and thus prevents performance and scaling problems), while still enabling to access and integrate the data.

The rest of the paper is organized as follows. *Section 2* introduces the problem and gives further motivation for our work. *Section 3* discusses related work. *Section 4* presents a novel solution for integrating structured and unstructured data. *Sections 5* and *6* describe all necessary changes applied to the SPARQL grammar and algebra, to enable the introduction of new operators. *Section 7* concludes the article.

2 Problem description and technological background

Information created and emitted by processes during the product/service lifecycle is usually designed for a specific context. This commonly entails that information is stored in formats that lack proper facilities for preserving metadata along with it (e.g., as plain comma-separated-values inside CSV files). This represents a major obstacle to a later analysis since it undermines the proper contextualization of the data. Colloquially, this way of storing data is referred to as “data lakes”: storage repositories that hold vast amounts of raw data in its native format until needed and without annotations that would support later contextualization (Anadiotis 2017). The amount of data stored in this way is constantly increasing, which (by itself) is starting to hinder efficient data analysis, as corporations are dealing with unstructured files of sizes in the range of Giga- or even Terabytes that cannot anymore be processed efficiently in practice.

To enable the efficient interpretation and extraction of useful, actionable information from such data, it is necessary to store it in a way, that ensures that relevant metadata (e.g., the data acquisition context and provenance information) is preserved and can be automatically processed. This is already relevant when attempting to optimize individual processes, for instance by enabling customized testing processes that are optimized for an individual product and its context. Additionally, preserving metadata is crucial for the analysis of systems of interrelated processes – especially if these processes are related to different phases in the lifecycle of a product or service. In this case, metadata is required to construct contextual bridges across the product lifecycle phases to answer questions such as: “How do quality variations during production translate to issues during the in-use phase of a product?” or “What implications do product usage patterns have for the design of the product itself, and for add-on services?”.

2.1 Open semantic framework

In order to create a system for managing and using semantically enriched data, the Open Semantic Framework (OSF; Mayer et al. 2017) was used. OSF provides an easy way of creating and managing groups of ontologies (so-called *knowledge packs*, which are built on top of RDF), thus supporting the maintenance, curation, and access to stored structured data that is relevant to a specific problem. Knowledge packs formalize possessed knowledge and also include metadata (context information, definitions, categories, etc.) about concepts in the domain.

Within OSF, the querying of knowledge packs is achieved via an HTTP API, which is linked to SPARQL queries. The querying is controlled by enabling only pre-formulated query templates that are specific to the knowledge pack, or group of knowledge packs, at hand. This gives designers of knowledge packs the ability to plan what information can be retrieved from a particular knowledge pack and eases the integration of the OSF in superposed processes as the integration can be achieved via well-defined HTTP calls. It also gives corporations the ability to price knowledge access based on the power/value of the executed SPARQL templates. Besides standard selection queries, OSF also supports update and construct queries. This allows a dynamic extension of knowledge packs during operation by integrating

new data in the system, thus creating the possibility for the system (and its underlying knowledge packs) to incorporate new information, thereby “learning” about new resources and relationships along the way. OSF is built on top of Apache Jena (McBride 2002) to manage RDF graphs and execute SPARQL queries over them.

To perform a SPARQL query, a sequence of steps needs to be executed. The key steps in this process are:

- *Query Parsing*: analyzing string description of the query according to the given formal grammar rules;
- *Algebra Generation*: generating an algebraic expression for the parsed query from the previous step;
- *Query Evaluation*: executing the created algebraic expression and producing a solution.

Every extension of the existing SPARQL query language that intends to be widely accepted in the community should be in accordance with its already well-known syntax. New extensions should be compatible with the old versions, adding new possibilities while not obstructing SPARQL’s core functionality.

2.2 Time series databases

While unstructured data can be stored in a variety of formats, it usually misses relevant metadata that would enable its integration in the knowledge management system. Additionally, as there is usually a large amount of those data, RDF is not a suitable means of storage.

As in the context of complex industrial processes one usually refers to a collection of data (values) generated during different phases of the product/service lifecycle, NoSQL time-series databases seem like an ideal candidate to store this information. Time-series databases are a type of database that are optimized for handling time-series data (i.e. a series of values (data points) indexed in time order). In our system, we used the popular InfluxDB time-series database. Optimized for storage and retrieval of time-series data, InfluxDB was ranked number one in DB-Engines Ranking of Time Series DBMS list in January 2016 (<https://db-engines.com/en/ranking/time+series+dbms> accessed on 05.03.2019.), and has maintained its ranking since. It provides support for a different kind of data analysis and querying using a SQL-like query language called InfluxQL. Another advantage of InfluxDB for our purposes is that it possesses an HTTP API which enables easy interaction with the database through its endpoints. The */query* endpoint is used to query data and manage databases. It accepts both GET and POST HTTP requests and returns the response in JSON format. These characteristics make it very suitable as a starting point to integrated structured knowledge with unstructured time-series data.

3 Related work

Accessing data through hyperlinks is one of the basic elements of the Semantic Web. The idea of storing merely a link to unstructured time-series data inside an RDF graph was proposed as part of the Melodies project (Almolda 2016), in the context of processing hydrological time-series data. Almolda (2016) used RDF to store data about the underlying model and provided hyperlinks to access the connected time-series data which were stored in relational databases. A series of Web services was implemented in order to enable access to time-series data through embedded hyperlinks. Those embedded hyperlinks already had to include all the necessary parameters to retrieve desired time-series data. It was not possible to add parameters afterward. This inability reduced users flexibility with respect to accessing remote data and allowed the use of only pre-defined hyperlinks. While Almolda (2016) integrated the two types of data, he used the official SPARQL query language to query RDF triples. This enabled him to manage embedded hyperlinks inside those queries, but not to manage and process time-series data themselves. We instead chose to directly extend SPARQL in order to provide integrated tooling for processing the two types of data we handle.

Other researchers and practitioners have proposed to extend SPARQL with additional features as well. Lefrançois M. et al. (2017) created SPARQL-Generate, an extension of SPARQL that generates RDF from RDF dataset, and a set of documents in arbitrary formats. Mizell et al. (2014) added graph functions to enable SPARQL-based graph analytics. They included a small set of build-in graph function.

A flexible extension of SPARQL, named f-SPARQL is proposed by Cheng J. et al. (2010). Their extension introduces a fuzzy logic into SPARQL. Bolles et al. (2008) extended SPARQL with the possibility to process data streams.

Historically, several proposed extensions to SPARQL have proven to be very useful and are today included as official SPARQL query language extensions. This includes Angles and Gutierrez (2011) who proposed including subqueries into SPARQL, and Alkhateeb F. et al. (2007) who developed the PSPARQL query language, an extension of the SPARQL query language which allows querying RDF triples using graph patterns whose predicates are regular expressions. Another popular and widely excepted SPARQL extension is C-SPARQL proposed by Barbieri et al. (2010). C-SPARQL adds support for executing continuous queries over RDF data streams.

4 Integrating structured and unstructured data

This section presents a way to link structured and unstructured data by the appropriate web-based embedding of unstructured formats which enable the usage of this data in the context of semantic technology platforms such as OSF. Specifically, the Web-based nature of OSF enables the use of embedded hyperlinks to access unstructured databases, thereby enabling us to integrate these two types of information while not obstructing processes that depend on the raw unstructured data. In other words, storing links to time-series data in RDF graphs, not the data themselves will be enough to later retrieve those data. Table 1 shows part of an ontology that describes one complex industrial development processes.

We propose using semantic relationships to enable incorporation of unstructured information (e.g., quality measures of a production process) in the process, thereby dynamically expanding the existing process knowledge and improving the expressiveness of the system and therefore the reasoning that can be achieved. The main challenge to enable this are the limitations of the current SPARQL syntax. We hence propose to extend the SPARQL query language by adding new operators that enable retrieving time-series data through hyperlinks that are embedded in the ontologies (by sending appropriate HTTP requests and parsing the obtained responses), and further processing retrieved data in other SPARQL queries. The extension to the SPARQL query language is demonstrated by implementing several changes in the SPARQL processor for Apache Jena. In the following, we describe in greater detail all the necessary extensions and changes made to enable the usage of SPARQL to accomplish this integration. We strive to keep the established query execution process unchanged as far as possible. In order to be able to properly detect new symbols and replace them with corresponding operators of algebraic expressions, we extended the SPARQL grammar and defined new algebraic operators. The rest of the steps of the query execution, i.e. evaluation, were merely extended with facilities to handle the additional operators but are otherwise equal to regular SPARQL executions. Throughout the process, our work remains compatible with the W3C SPARQL definition.

Table 1: Part of an ontology describing one complex industrial development processes

@prefix cavl:	<http://pro2future.at/schemas/cavl#> .
@prefix owl:	<http://www.w3.org/2002/07/owl#> .
@prefix rdf:	<http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs:	<http://www.w3.org/2000/01/rdf-schema#> .
@prefix xsd:	<http://www.w3.org/2001/XMLSchema#> .
...	
cavl:DevTaskProcess	
rdf:type	owl:Class ;
rdfs:comment	"Dev Task Process class that models testing process."^^xsd:string ;
rdfs:label	"Dev Task Process"^^xsd:string ;
cavl:devTaskSetup	cavl:DevTaskSetup ;
cavl:targetCharacteristic	cavl:CharacteristicValue ;
cavl:linkToTimeSeries	"http://192.168.56.104:8086/query"^^xsd:string ;
.	
...	

5 Extended SPARQL grammar

The first step towards extending SPARQL by adding new operators is to extend the SPARQL grammar in order to be able to parse queries containing newly inserted elements. This extension should not affect the existing, already well-known SPARQL operators. While extending the grammar, we tried to preserve the logic of SPARQL syntax as much as possible. The extension fits well into existing SPARQL syntax and is a natural addition to already existing possibilities of the language. Table 2 shows the extension of the EBNF notation used in the grammar (based on Prud'hommeaux et al. 2013). Newly added terms are shown in bold font.

Table 2: Extension of the EBNF notation

Query	::= Prologue (SelectQuery | TimeseriesQuery | ConstructQuery | DescribeQuery | AskQuery) ValuesClause
TimeseriesQuery	::= TimeseriesClause HyperlinkClause ParametersClause * TimeseriesModifier
TimeseriesClause	::= ' TIMESERIES ' TimeseriesVar +
TimeseriesVar	::= '(' VAR3 'AS' Var ')'
VAR3	::= '% JSONDATANAME '
JSONDATANAME	::= (PN_CHARS_U | [0-9]) (PN_CHARS_U | [0-9] | #x00B7 | [#x0300-#x036F] | [#x203F-#x2040]) * (PN_CHARS_I) ?
PN_CHARS_BASE	::= [A-Z] | [a-z] | [#x00C0-#x00D6] | [#x00D8-#x00F6] | [#x00F8-#x02FF] | [#x0370-#x037D] | [#x037F-#x1FFF] | [#x200C-#x200D] | [#x2070-#x218F] | [#x2C00-#x2FEF] | [#x3001-#xD7FF] | [#xF900-#xFDCF] | [#xFDF0-#xFFFD] | [#x10000-#xEFFFF]
PN_CHARS_U	::= PN_CHARS_BASE | '_'
PN_CHARS_I	::= #x002E JSONDATANAME | #x005B [0-9]* #x005D (PN_CHARS_I)?
Var	::= VAR1 | VAR2
HyperlinkClause	::= ' HYPERLINK ' (IRIREF | SelectHyperlinkQuery)
SelectHyperlinkQuery	::= '{ ' GETLINK ' Var DatasetClause* WhereClause OrderClause? }'
DatasetClause	::= 'FROM' (DefaultGraphClause | NamedGraphClause)
WhereClause	::= 'WHERE'? GroupGraphPattern
OrderClause	::= 'ORDER' 'BY' OrderCondition+
IRIREF	::= '<' ( [^<>"{}|^\`]-[#x00-#x20]) * '>'
ParametersClause	::= ' PARAMETER ' VAR4
VAR4	::= PARAM_NAME PARAM_VALUE
PARAM_NAME	::= '\$' PARAMETER_NAME
PARAM_VALUE	::= "' PARAMETER_VALUE '"
PARAMETER_NAME	::= ([#x0000-#x009F] | [#x00A1-#xEFFFF]) *
PARAMETER_VALUE	::= ([#x0000-#x009F] | [#x00A1-#xEFFFF]) *
TimeseriesModifier	::= TimeseriesOrderClause ? LimitOffsetClauses?
TimeseriesOrderClause	::= 'ORDER' 'BY' TimeseriesOrderCondition +
TimeseriesOrderCondition	::= (('ASC' | 'DESC') '(' Var ')') | Var
SelectQuery	::= SelectClause DatasetClause* WhereClause SolutionModifier
WhereClause	::= 'WHERE'? GroupGraphPattern
LimitOffsetClauses	::= LimitClause OffsetClause? | OffsetClause LimitClause?
GroupGraphPattern	::= '{ (SubSelect | SubTimeseries | GroupGraphPatternSub) }'

SubTimeseries	::= TimeseriesClause HyperlinkSubClause ParametersClause* TimeseriesModifier
HyperlinkSubClause	::= 'HYPERLINK' (IRIREF | SelectHyperlinkSubQuery)
SelectHyperlinkSubQuery	::= '{ 'GETLINK' Var WhereClause OrderClause? }'

The most important change introduced by our extension is the creation of a new type of query, the TIMESERIES query -- marked as *TimeseriesQuery* in Table 2. This type of query enables retrieval of data from a given link, processing those data and its interpretation as a SPARQL result (result has the same form as a result of regular SELECT query). That enables post-processing of retrieved data within an enclosing SELECT query. The syntax of a *TimeseriesQuery* syntax is similar to the syntax of a regular SELECT query (see Table 3).

The *TimeseriesClause* element refers to the result bindings of the query. Accessing a Web service with time-series data through a link given in TIMESERIES query (see below: *HyperlinkClause* and *ParametersClause* elements) returns a response in JSON format -- an array of JSON responses. *TimeseriesQuery* has to interpret that response in a well-known SPARQL form in order to enable its further use in the enclosing queries. *TimeseriesClause* is what supports this process: it defines parts of JSON responses which will be present in TIMESERIES query result bindings in a placeholder variable referred to as *VAR3* (note that the SPARQL *SelectClause* already defines *VAR1* and *VAR2*), and its corresponding naming in *Var*. As JSON responses might not contain only simple key-string/number/boolean/null value pairs, but also complex key-JSON object value and/or key-JSON array value pairs, *VAR3* enables access to simple values to an arbitrary level of nesting inside JSON response. We use the typical JSON notation to express this, i.e. a dot followed by a field name to access a JSON field value and an index value within square brackets to access an element of a JSON array.

The *HyperlinkClause* element defines a hyperlink to a Web service with data. The hyperlink can be given as an Internationalized Resource Identifier reference (*IRIREF*), or as a result of a nested subquery called a *SelectHyperlinkQuery*. The possibility to retrieve a link as a result of a nested query enables users to embed unstructured data into the knowledge management system, i.e. store a hyperlink to a Web service with time-series data as a part of an ontology (subject or object in an RDF triple). *SelectHyperlinkQuery* has a very similar form to a regular SELECT query; it however makes use of the GETLINK keyword, can have only one column in its result bindings, and supports only a single returned result.

The *ParametersClause* element defines parameters to be appended to the hyperlink defined in *HyperlinkClause* when accessing remote data. One can set a desired number of parameters. Every parameter is set using the keyword PARAMETER after which follow the pair of parameter name, parameter value. Importantly in the context of using InfluxDB to store unstructured data with these new SPARQL options, *ParametersClause* enables creating InfluxQL queries as a part of a hyperlink directly using query parameters. *ParameterClause* is an optional element of *TimeseriesQuery*.

TimeseriesModifier element is analogous to standard SPARQL *SolutionModifier*, but with a narrowed scope that only permits *order* and *limit* modifiers.

In order to enable post-processing of result bindings of TIMESERIES query, we created the possibility of nesting time-series queries inside SELECT queries. This type of subquery is

referred to as *SubTimeseries*. Most of the elements of *SubTimeseries* are the same as for *TimeseriesQuery*, with the exception that *SubTimeseries* does not have a *DatasetClause* -- this is similar in name and function to SPARQL's *SubSelect*, which also misses a *DatasetClause*.

5.1 An example of combining structured and unstructured data using our SPARQL extension

Let's observe the case when we manage information about a complex development process in a corporation. Every complex development process can be viewed as a set of different development tasks. Each of those tasks is used during the development to determine some specific characteristic of the process. The task is being performed as a sequence of stages, where that sequence is not strictly defined within the task and stages can be repeated.

During development processes, different tasks are being executed and many useful information about the process is produced. Those data could give insights into how different characteristics change during development task, how different stages of the task affect the characteristic, etc. but their deficiency is their form (unstructured data), and lack of relevant metadata. We store them in an InfluxDB. Expert knowledge about the domain (structured data with relevant metadata) is stored in knowledge packs in RDF form. Knowledge packs contain information about different types of development tasks that can be performed, their setup, characteristics they determine, etc. They also contain links to Web service with the InfluxDB instance containing unstructured data about the domain.

In Table 3, we give a working example of using our SPARQL extension in described domain. This example demonstrates one simple enrichment of unstructured data by linking those data with the proper characteristic. We are querying for the information about all the stages that have to be executed in order to determine given characteristic (stage itself and the impact it has on the characteristic). Using the GETLINK operator, we retrieve a link to a Web service with InfluxDB instance. The PARAMETER operator enables us to set appropriate parameters for accessing InfluxDB instance: using parameter *\$db* we set the target database for the query; using parameter *\$q* we set InfluxQL string to execute. TIMESERIES query will combine retrieved link and provided parameters to form a complete hyperlink to access desired data.

Table 3: An example of a query using newly introduced operators

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX cavl: <http://pro2future.at/schemas/cavl#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>

SELECT ?reflectCharacteristic ?stage ?influence
WHERE {
  {
    TIMESERIES(%tags.stage AS ?stage)
      (%values[0][1] AS ?influence)
    HYPERLINK {
      GETLINK ?link
      WHERE {
        ?devTaskProcessType rdfs:subClassOf ?devTaskProcess .
        ?devTaskProcessType cavl:targetCharacteristic ?characteristic .
        ?devTaskProcess cavl:linkToTimeSeries ?link .
      }
      ORDER BY DESC(?link)
    }
  }
  PARAMETER $db "my_db"
  PARAMETER $q "SELECT *
    FROM (
      SELECT MEAN(\"difference\") as \"influence\"
      FROM (
        SELECT \"stage\",
          ABS(\"in_value\"-\"in_target\")/\"in_target\" -
          ABS(\"out_value\"-\"out_target\")/\"out_target\" as
\"difference\"
        FROM \"FuelConsumption\"
      )
      GROUP BY \"stage\"
    )
    GROUP BY \"stage\"\"
  ORDER BY ASC(?characteristicName) DESC(?influence)
  LIMIT 10
}

BIND (?characteristic as ?reflectCharacteristic) .
}
```

6 Extended SPARQL algebra

In addition to extending the SPARQL grammar, also its algebra needs to be augmented by precisely defining all new operators. As when extending SPARQL grammar, we tried not to deviate much from the well-known SPARQL algebra.

Translating SPARQL query objects to an algebraic expression is one of the most important steps when executing a query. As familiar from the standard, the process of generating algebra expression converts queries by first converting all of its nested queries, one by one. This process is applied recursively on all subqueries.

Each of the abstract query symbols has to have a defined operator for its evaluation. In the following, we define all newly inserted symbols and their operators, in the same way as this is done in the SPARQL W3C recommendation (Prud'hommeaux et al. 2013).

Since we introduced a new query type and its element *TimeseriesClause*, we need to define two new operators: *alias* and *extract*.

Definition: Alias

Let μ be a solution mapping, Ω a multiset of solution mappings, *var* a variable and *key* an identifier of a field of a JSON object. Every *key AS var* element in *TimeseriesClause* is being translated to *alias*(Ω , *var*, *key*) term in SPARQL algebra.

Then we define:

$$\begin{aligned} \text{alias}(\mu, \text{var}, \text{key}) &= \mu \cup \{ (\text{var}, \text{value}) \mid \text{var not in dom}(\mu) \text{ and value} = \text{key}(\mu) \}, \\ \text{alias}(\mu, \text{var}, \text{key}) &= \mu \text{ if var not in dom}(\mu) \text{ and key}(\mu) \text{ is an error,} \\ \text{alias}(\mu, \text{var}, \text{key}) &\text{ is undefined when var in dom}(\mu), \\ \text{alias}(\Omega, \text{var}, \text{key}) &= \{ \text{alias}(\mu, \text{var}, \text{key}) \mid \mu \text{ in } \Omega \}. \end{aligned}$$

The cardinality of solution mapping in a multiset of solution mappings remains the same after applying this operator, ie. $\text{card}[\text{alias}(\Omega, \text{var}, \text{key})](\mu) = \text{card}[\Omega](\mu)$.

Definition: Extract

Let Ψ be a multiset of solution mappings and *PV* a set of variables. Every *TimeseriesClause* with *PV* set of variables is being translated to *extract*(Ψ , *PV*) term in SPARQL algebra. For mapping μ , *extract*(μ , *PV*) is the restriction of μ to variables in *PV*.

Then we define:

$$\text{extract}(\Psi, \text{PV}) = \{ \text{extract}(\mu, \text{PV}) \mid \mu \text{ in } \Psi \}.$$

The cardinality of solution mapping in a multiset of solution mappings remains the same after applying this operator, ie. $\text{card}[\text{extract}(\Psi, \text{PV})](\mu) = \text{card}[\Psi](\mu)$.

The order of *extract*(Ψ , *PV*) must preserve any ordering given by *OrderBy*.

The core element of this extension is the *HyperlinkClause*, which contains a link for retrieving the remote data. That link can be given as a simple *IRIREF* or as a result of a nested subquery. The two different ways of setting the link imply the need for introducing two new operators since there is a need for different behavior in each of the cases. One operator (URI value) will be used whenever the link is given as an *IRIREF*. It will in that case simply combine the given link with parameters to form a complete link to access remote data. The other operator (URI subquery) will first retrieve link through a given subquery and then combine it with parameters to form a complete link to access remote data. It will be used when link is given as a result of nested subquery.

Definition: URI value

Let *uri_value* be the way to retrieve data from remote server *S*, *iri* a link to a Web service,

params URI parameters for that link and let server *S* return a result in form of JSON array object. μ is a solution for *uri_value* from *S* when a response from *S* is a JSON array with keys that make a pattern instance mapping *P* and μ is the restriction of *P*.

Then we define:

$$\Omega = \text{uri_value}(\text{iri}, \text{params}), \mu \text{ element of } \Omega.$$

The number of distinct μ in Ω equals the number of JSON elements in returned JSON array, ie. $\text{card}[\Omega] = \text{length}(\text{resulting JSON array})$.

Definition: URI subquery

Let *uri_subquery* be the way to retrieve data from remote server *S*, Ω_1 multisets of solution mappings containing a link to a Web service, *params* URI parameters for that link and let server *S* return a result in form of JSON array object. μ is a solution for *uri_subquery* from *S* when a response from *S* is a JSON array with keys that make a pattern instance mapping *P* and μ is the restriction of *P*.

Then we define:

$$\Omega = \text{uri_subquery}(\text{iri in } \Omega_1, \text{params}), \mu \text{ element of } \Omega.$$

If $\text{card}[\Omega_1] \neq 1$ and $\text{card}[\Omega_1](\mu_1) \neq 1$ is an error.

The number of distinct μ in Ω equals the number of JSON elements in returned JSON array, ie. $\text{card}[\Omega] = \text{length}(\text{resulting JSON array})$.

ParametersClause of *TimeseriesQuery* introduces the possibility for users to define an arbitrary number of parameters, which will be used later when accessing remote time-series data.

Definition: Parameter Pattern

A parameter pattern is a member of the set: (*parameter_name* x *parameter_value*).

Every *PARAMETER parameter_name parameter_value* from *ParameterClause* is being translated to *parameter parameter_name parameter_value* in SPARQL algebra.

Definition: Basic Parameter Pattern

A Basic Parameter Pattern (BPP) is a set of parameter patterns.

Any adjacent parameter patterns from *ParameterClause* collected together form a BPP. Let

PARAMETER parameter_name1 parameter_value1

PARAMETER parameter_name2 parameter_value2

be a *ParameterClause*, then it is being translated to

bpp(

(parameter parameter_name1 parameter_value1)

(parameter parameter_name2 parameter_value2))

in SPARQL algebra.

Table 4 shows how the SPARQL query from Table 3 is translated to SPARQL algebra.

Table 4: An example of how a query that makes use of our newly introduced operators is translated to SPARQL algebra.

```
(project (?reflectCharacteristic ?stage ?influence)
(extend ((?reflectCharacteristic ?characteristic))
(extract ( ?stage ?influence)
(order ((asc ?characteristicName) (desc ?influence))
(alias ((?influence ?values[0][1]))
(alias ((?stage ?tags.stage))
(uri_subquery
(slice _ 1
(project (?link)
(order ((desc ?link))
(bgp
(triple ?devTaskProcessType <http://www.w3.org/1999/02/22-rdf-syntax-ns#subClassOf>
?devTaskProcess)
(triple ?devTaskProcessType <http://pro2future.at/schemas/cavl#targetCharacteristic>
?characteristic)
(triple ?devTaskProcess <http://pro2future.at/schemas/cavl#linkToDataserie> ?link)
))))
(bpp
(parameter $db "my_db")
(parameter $q "SELECT *
FROM (
SELECT MEAN("difference") as "influence"
FROM (
SELECT "stage",
ABS("in_value"-"in_target")/"in_target" -
ABS("out_value"-"out_target")/"out_target" as
"difference"
FROM "FuelConsumption"
) GROUP BY "stage"
) GROUP BY "stage")")
))))))
```

7 Conclusion

This paper described an extension of SPARQL query language we proposed as a solution for integrating structured and unstructured data. Structured data are semantically enriched data that contain relevant metadata. Those data represent formalized knowledge about the processes being performed, including context information, definitions, etc. Unstructured data are data produced during execution of those processes. Those data are usually stored in formats like plain comma-separated-values inside TXT or CSV files, without any metadata information. Our solution kept the two types of data physically separated while bridging the gap between them. We stored and managed structured data using OSF, within which

knowledge packs are built on top of RDF, in the form of RDF triples. Those triples were queried via SPARQL query language. We stored unstructured data in a time-series database, called InfluxDB, specially designed for this type of data. InfluxDB provided an easy way for querying data through an HTTP endpoint, using a SQL-like query language.

Our main idea was to use the Semantic Web possibility of accessing data through hyperlinks. We embedded hyperlinks to access unstructured databases inside structured RDF models while extending SPARQL query language in order to enable simultaneous processing and exploitation of two types of data. Our extension enabled retrieving time-series data inside newly inserted type of queries called TIMESERIES queries and their afterward processing in enclosing queries.

It is possible to further upgrade our extension in order to make it more flexible in the future. Extending the scope of TIMESERIES queries by making them able to consume response retrieved from a Web service in any kind of standard format (not only JSON) would enable using any kind of data that is available online.

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Typological characteristics of individual unlearning

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Abstract: Organizations have sought solutions to produce consistent, competent practices while updating organizational processes. Previous learning performance strategies used traditional methods by identifying gaps in knowledge, then teaching lacking information to close the gap. Knowledge base change create difficulties for individuals who must unlearn, store, and use new knowledge processes to update the old. Knowledge change, or *unlearning*, speculated to involve a replacement of prior knowledge, may result in faulty learning completion processes, yield decreased work product quality, reduce productivity, and create increased production costs. Inconsistencies regarding conceptualizing the unlearning process persist due to anecdotally based research. This qualitative study aims to further understand initiation processes used and clarify factors when updating knowledge: 1) How does *individual unlearning* initiate? and, 2) What additional factors contribute to the *unlearning* process? Three weekly-spaced interviews with 31 participants re-categorized unlearning using the Rushmer and Davies (2004) typological unlearning process model. Predominately two knowledge change typologies were demonstrated, an updated unlearning model developed, and proposed recommendations for training applying this research.

Keywords: Knowledge change, unlearning initiation, update training, organizational change, competitive advantage

1 Introduction

Change is a part of our global business environment. Organizational leaders deal with ever-expanding knowledge base and its implications. Marketplace shifts, regulatory, and technological process modifications all impact the success potential of a business.

As the amount of information within an organization increases, knowledge is increasingly more difficult to manage. There has been a rapid rise in the number of organizations that produce goods and services within the global marketplace that depend upon consistent knowledge management practices. Knowledge acquisition and management is now an essential component to maintaining a competitive advantage. When the ability to manage the precious resource of knowledge is effective, organizations understand the value and use of their knowledge base (Hafner, 2014). Those organizations that use knowledge management strategies will develop ahead of those that manage tangible items such as, goods, labor, or resources. The organizations and individuals that are have the capacity to use knowledge management concepts have advantage over those that do not (Starkey, Tempest, & McKinlay, 2004).

When organizations fail to maintain competitive advantage, change becomes necessary. The difficulty arises when leaders must create the rapid alteration of actions, behaviors, and 'mental models' within their employees to produce needed procedural change (Senge, 2006).

It is the ability of individuals within organizations to produce the needed changes in their previously held actions and procedures which is of interest as these individuals drive the organization to meet goals. Modifications of current competencies during change and how they occur continue to play a large role in organizational success or failure (Rushmer and Davis, 2004). Although forgetting and extinction may have some indirect impact on the unlearning process, they will not be included in this discussion as it is specifically the change process that is the focus in the following study.

Rapid shifts in current knowledge base is essential to performing organizational tasks, where avoiding errors, and rework impact the type and amount of change success (Becker, 2010; Hafner, 2015). Previous research across many disciplines has been more interested in learning, and other forms of knowledge acquisition in individuals and organizations. This information has helped develop training methodologies that maximize worker competencies, however all knowledge is not acquired. Learning concepts continue to perpetuate confusion where unlearning is concerned.

In times of rapid organizational shifts, such as the introduction of a new product, or a technological advance, *unlearning* is needed to perform in new ways based on the previous competency level. This may also be true when current skills become obsolete. Unfortunately, individuals within organizations may be unable, or unwilling to abandon current knowledge base, beliefs, processes, and values rapidly enough, or unlearn, when confronted with new and updated information (Morais-Storz, and Nguyen, 2017; Starbuck, 2017).

Often organizations use a 'forceful trigger' to begin the process of unlearning after a failure, or during crisis management (Morais-Storz, and Nguyen, 2017, p. 93). When making needed change, individual unlearning may not be successful without a lack of a trigger, thus key changes fail to occur. Previous studies suggest, the most resilient organizations and individuals use a unique orchestration that yield not only successful, but a complete change process and avoid the consequence of technological upset (Hafner, 2017). Unlearning continues to be an under-researched topic, requiring further investigation. Results may forge the divide between knowledge acquisition and change processes. Implementation in training with individual workers impact effectiveness of organizational change. It is here we examine unlearning initiation in organizational individuals faced with outdated knowledge and processes that are ineffective in the current environment.

Historically, many theories of learning provide foundation and theoretical basis for this complex process. It has been postulated learning and unlearning processes have potentially a similar process. Learning theory principals, methods of knowledge acquisition and extinction, change theory, concepts of forgetting, have all contributed current understanding of unlearning. The objective of theoretical review is to shine light on interdisciplinary information and theories contributing to unlearning.

2 Theoretical literature

2.1 Early theorists of learning

From the early leaning theorists in classical conditioning, associating behaviour to stimuli, to the consequences of behavioural reinforcement theorists, learning has been of interest. The “laws of learning” gave rise to how learning occurs in individuals (Thorndike, 1932; Pavlov, 1927; Skinner, 1953).

Bloom’s taxonomy added three types of learning; the cognitive, the affective, and the psychomotor/sensory domains (Bloom, and Krathwohl, 1956). This model not only characterizes knowledge acquisition, and are now postulated to impact unlearning (Hafner, 2014). The cognitive domain characterizes learning processes as to: *Remember, Understand, Apply, Analyze, Evaluate, or Create* when acquiring new knowledge (Bloom, and Krathwohl, 1956). The affective domain examines the emotional side of acquisition, whereas the cognitive domain examines processes of higher-order reasoning and self-control. In the psychomotor domain, sensory information produces motoric activity, such as in operating a computer (Bloom, and Krathwohl, 1956).

In the first two domains, when emotion, self-regulation, and resistance where willful control exists, difficulty in separating the emotion and control from the process of knowledge change may be occurring. Knowledge change that focuses on non-self-regulation or behavior that is unable to be wilfully controlled requires different brain effort. Previous studies completed may have blurred the process by considering all processes equivalent by adding emotion, environments and other barriers overarching the process. Therefore, unlearning may not be observed in its purest form, in isolation. It is only in the psychomotor domain that study of unlearning be pinpointed where process initiation begins, in this author’s opinion.

Argyris and Schon seminal work in “single” and “double” loop learning helps to explain adult learning processes (Argyris and Schon, 1978). Single loop learning involves changing actions to close the gap in skills and involves a focus on error detection and correction, whereas double loop learning views the process through adding a reflective questioning of the actual framework of knowledge and realization that knowledge held may be faulty and require correction (Argyris and Schon, 1978). The impact of this research suggests questioning and knowledge change when errors are detected, may be central to the emerging theory of unlearning.

Mezirow differs by suggesting three learning stages: the *instrumental*, where awareness of new learning begins, followed by transmission of knowledge in *transformation* and *communicative* phases (Mezirow, 1991). The first level of learning, the instrumental stage, activities that may be equated with theories of Starbuck where testing of the old and experimentation with the new occurs (Rushmer, & Davies, 2004; Starbuck, 2007, 1996). At this juncture unlearning diverges from these theorists.

In knowledge acquisition, the individual develops skills through adding content-based information (Mezirow, 1991). Problem solving skills with reflection produces new actions. Transformation as proposed by Mezirow compares to Senge’s concept of reflection and discourse where the individual sorts out their previously held ‘mental models’ and reconciles them with newly acquired knowledge (Mezirow, 1991; Senge, 2006). These ideas, although

seminal in psychology, education, leadership, and knowledge management studies, continue to create additional confusion, and fail to pinpoint factors needed to describe unlearning.

2.2 The unlearning theorists

Currently, researchers have recently returned to unlearning due to its importance in both the organizational and individual learning processes (Becker, 2017, 2010; Hafner, 2014). Table 1 outlines seminal theorists to provide the reader with perspective and insights to open problems.

Unlearning is the process of replacement or disuse of knowledge, action, or procedure, resulting in changed knowledge (Hafner, 2014; Hedberg, 1991; Starbuck, 1996, 2017). Unlearning contributes to the learning process explaining change. Change processes involving modification or replacement of old learning may indicate unlearning has occurred, thus completing a knowledge change process (Becker, 2010; Hedberg, 1991).

When old, automated habits make way for new actions and behaviors, automatic knowledge becomes unconscious (Starbuck, 2017, 1996). The individual develops a state of unconsciousness unawareness of the procedure or action involving knowledge (Clark, 2010). Unconscious completion of a task is, in this authors opinion, a pure form of unlearning when the emotion and regulatory influences are removed. As a habit is formed, defined as automatic, unconscious actions are developed through repeated patterns of behavior (Quinn, Pascoe, Wood, and Neal, 2010). When changing knowledge, realization about the need to update occurs when the current behaviour used is no longer successful. (Senge, 2006). It is the repetition of behavior in context that creates the ability to maintain a mental model and becomes stabilized and until change is initiated again (Clark, 2010; Hedberg, 1991). This habit, routinized and stabilized knowledge, becomes the current knowledge base for behavior and mental models for use (Hafner, 2014).

When old, automated habits make way for new actions and behaviors, automatic knowledge becomes unconscious (Starbuck, 1996). The individual develops a state of unconsciousness unawareness of the procedure or action involving the changed knowledge (Clark, 2010). The unconscious or habitual parts of the unlearning process remain unidentified (Becker, 2017, 2007; Hafner, 2015). There has been little empirical study specifically on individual knowledge change. This may be where confusion between learning models and the unlearning models exist. Studies fail to examine routinized, automatic motoric behaviors central to a pure form of knowledge change, the unlearning process.

For example, according to French and Denahaye, (1996), "At present, there is little information on individual change in organizations because approaches to managing change have been developed at the group or system level" (p. 22). Theorists also fail to account for issues of knowledge storage, retrieval and successful processes. For example, Klein posits that storage of knowledge is a problem central to unlearning (French & Denahaye, 1996). Individual unlearning initially postulated by Newstrom to be a total removal of old knowledge, or a production of a "clean slate". This would suggest the brain actually erases unneeded information with the process termed organizational "forgetting" (Newstrom, 1983; Clark, 2010). Clark has discounted this concept as faulty, suggesting knowledge in the brain could not be expansive enough to store and process expanding amounts of data without capacity (Clark, 2010).

Authors Griswold and Kaiser (2017), theoretically suggest that reducing old influencers trigger disequilibrium in previously held routines. These behaviors are discarded intentionally to become a better version self, however this implies unlearning is entirely under cognitive control (Griswold, & Kaiser, 2017). Knowledge during change has continues to create confusion because self-regulatory and higher-level cognitive functions are incorrectly identified as unlearning. In these studies, unlearning is a cognitively based process whereby old knowledge can be chosen to be changed or used (Griswold, & Kaiser, 2017).

Clark best summarized unlearning through these three distinct features by stating:

1) Adults are largely unaware of how they acquire, use, and change, knowledge; 2) When change strategies fail, one unexamined cause is the interference from automated and cognitive behaviors; and, 3) how to unlearn dysfunctional automated and unconscious knowledge has not been examined (Clark, 2010).

Unlearning may involve three different types as suggested by Rushmer and Davies (2004) where unlearning can be passive during behavior change (Rushmer, & Davies, 2004). Consider the functions of clerks that complete standardized forms. When a new form is introduced, a process change occurs. Over time, a new routine replaces the old process because the old form is no longer available. Some form of disuse or forgetting occurs where past learning is no longer used (Rushmer, & Davies, 2004).

Knowledge change, the second typology, involving new procedures and behaviors, called 'wiping', involves a deliberate unlearning with speed where experimentation and insight produces change. The individual possesses abilities to stop behaving, or is influenced to make process changes (Rushmer, & Davies, 2004). Wiping occurs when there is a recognition that knowledge base and resulting actions need to be updated and is facilitated by awareness. Holding onto outdated ideas have the consequence of error production in job actions. For example, the change in a drug regimen to prevent heart attacks or stroke is now used in healthcare; or in computer systems, when the updating of a system creates change where continued operation using old processed would be inefficient or impractical are two such examples of wiping typology (Rushmer, & Davies, 2004).

Stories of companies such as 3M, Toyota, and Sony are other examples of the use of wiping typology and involves a change in current knowledge (Becker, 2007; Rushmer, & Davies, 2004). Contrarily, there are numerous accounts where information was ignored or discounted preventing the initiation of wiping typology in unlearning. One historical account suggested in advance that there would be an attack on Pearl Harbor. The knowledge base was held tightly. Evidence to the contrary was ignored, and no action was taken to prevent the attack, thus, knowledge unlearning did not occur (Becker, 2007; Starbuck, 1996).

The third typology, 'deep unlearning', occurs when unlearning is totally disruptive through a sudden event. The event impacts the individual so strongly that the individual is initiated to unlearn. The force is directed to the individual from an outside catalyst, such a marketplace changes or organizational initiatives (Rushmer, & Davies, 2004). The experience is often described as painful and so rapid that reflection and processing are limited. Previous activities are no longer performed the same and transformation has occurred. These typologies are worthy of study with possible application for business and industry (Rushmer, & Davies, 2004).

3 Problem statement

The acquisition, refinement, and change of basic employee competency in light of the environmental, technological, regulatory, and financial changes within the marketplace present an ongoing problem for organizations (Argyris, & Schon, 1978; Becker, 2010; Hafner, 2017). Attempting to acquire and maintain current knowledge involves transmission of knowledge from the organization to the individual employee (Becker, 2007; Hafner, 2017, Senge, 2006). Previous behaviors, competencies, and old knowledge are updated continually to maximize business success through competitive advantage (Hafner, 2015; Starbuck, 2017). However, required changes in acquisition and management of knowledge processes are ongoing.

For the individual within the organization, additional processing, retention, and modification of their knowledge base to correctly perform job-related procedures is necessary. Surviving organizational knowledge change and maintaining personal competencies with updated knowledge is a problem (Clark, 2010).

Without implementation of a knowledge management process for employees, added time, energy, and discord in completing job functions, with the potential for work product errors may result. Poor knowledge management yields unintended operating costs for the organization. These processes require further investigation to determine strategies for effective knowledge change in organizational individuals (Becker, 2010; Hafner, 2015).

With individuals responsible for completing new tasks, the strategy of how to change or “unlearn” previous processes and produce new competencies has been of interest. Previous studies have considered unlearning through a variety of larger lenses but individual unlearning has lagged behind with disagreement regarding consistency in unlearning concepts (Hislop, 2013). The unique characteristics of this process remain somewhat ill-defined for employees and much work remains (Becker, 2010; Hafner, 2015). Unlearning remains an undiscovered process and characteristics with worthy studies from many disciplines has yet to define specifics of the process or environmental conditions.

This paper attempts to extend the unlearning concept by: 1) re-investigation and collection of descriptive characteristics of individual employee unlearning using Rushmer and Davies (2004) unlearning typologies; and 2) propose additional refinements and a conceptual model of the unlearning process. To assess this problem, the research questions are:

RQ1. How is individual unlearning initiated within change-based organizations?

SQ 1. What typologies are exhibited in the unlearning process as outlined in Rushmer and Davies (2004)?

In order to answer RQ1, multiple semi-structured interviews allowed participants to discuss job role unlearning experiences (Seidman, 2013). Participants’ thoughts and perceptions about the unlearning typologies were identified, categorized, and subsequently analysed for initiation processes and exhibited factors.

3.1 The practical problem

Organizations cannot continue to exist resting on skills and processes of yesterday. Competitive advantage relies on external timing and the ability to shift to new processes. Leaders envision the larger organizational picture and create solutions to environmental challenges; however, these strategies require implementation. Employees must update and refine skills, creating instability. Adjusting to changes requires unique modifications otherwise, resistance, errors, and other change barriers may limit the effectiveness of stabilized change.

Today's training processes will not meet future challenges. Quality of unlearning in an employee may impact effective completion of innovation processes (Rushmer & Davies, 2004). Employees will have unlearned; however, only through repeated action a consistent new skill can be produced (Neal et al., 2006). The gap created between old and emerging new skills must be closed to allow for effective change to occur. Thus, the application of unlearning to knowledge change process training will be discussed.

4 Design and methodology

This study focused on unlearning involving a change in procedures in operation of computer applications. A mid-sized engineering firm in the United States using computer systems provided participants for this study. The organization instituted a company-wide upgrade in their Windows environment creating the need for unlearning of previously routinized actions, thus job function processes became obsolete.

Engineering employees (32) stated that they were expert users in the current system prior to the company-initiated modifications. The organization instituted the change due to an outside environmental force creating an outdated system. The specific change in computer systems involved outdated systems or applications, such as Windows 7, with a change to Windows 8. The updated systems involved user interface that had significant revisions. The recent change in computer systems and application for job tasks required employees to use actions that were not available in the previous Windows system or application.

These updated systems made the knowledge base ineffective, obsolete and inoperable in the operation of the upgraded system. For this study, the instituted change was considered a revision to previously used automatic motor movements where current skills were deemed obsolete and unusable thus, required knowledge change and an unlearning of the old system.

Participants were selected via convenience sampling at a mid-sized Florida based engineering firm in 2014. Subsequent to admission and permission study requirements, one-on-one participant interviews, collection, and coding of data completed this study. The participants were distributed between 20- 55 years of age, and balanced in gender between males and females. All participants volunteered to be part of the study without remuneration.

The participants were responsible for driving the research with their responses to open-ended, semi-structured questions. Key characteristics, events, and contexts of the

participant's information were recorded throughout the interview process for later coding (Charmaz, 2011, 2007). The participants' direct quotations were categorized by occurrence frequency through tabulation. Understanding messages within participant's data required creativity and critical thinking processes to be properly analysed (Creswell, 2003). The participants were considered adept at the system and application they were currently using so that their actions had become routinized. Due to a directed force, participants were required to modify actions to perform tasks. The results are listed in Table 1.

The purpose of this qualitative study is to collect data that includes the "voice" and experiences of the participants in unlearning typologies suggested by (Corbin, and Strauss, 2008; Rushmer & Davies, 2004). Analysis of the responses used open coding. Two phases were used to categorize data. Open coding identified areas of focus and helped to categorize each response of occurrence, with statements about the unlearning process. In the first phase, two independent coders sorted response data obtained from survey questions. The second involved weak member checking. According to Corbin and Strauss, "... Researchers are the translators of other person's words and actions" by (Corbin, & Strauss, 2008, p. 49). This methodology is the vehicle of data collection and analysis by (Corbin, & Strauss, 2008).

In the first interview, results recorded the participants' perceptions about their unlearning experiences during a computer system knowledge base change. Selected quotes from the interview process were coded with some participants producing more than one statement about their unlearning experiences by (Corbin, & Strauss, 2008). Total participant reports from all interviews were: the concept of wiping (103 quotes), the concept of deep learning experiences (56 quotes) and the concept of routine unlearning (0 quotes).

The analysis of the first interview indicated 64 participants' quotations discussed wiping techniques initiated their unlearning process. The results from these interviews indicated 39 participants identified deep unlearning. No reports of routine unlearning were collected. In both interviews, there were 4 quotes that were categorized as other as they did not relate to any type of unlearning in the Rushmer and Davies typologies and were discarded from the study.

In the second interview, results mirrored the first interview. Quotes relating experiences were selected from the interview process and again multiple quotes were collected. 43 of the participants' quotations discussed wiping techniques to initiate their unlearning process of a computer system knowledge base change. The results from these interviews indicated 13 participants identified deep unlearning.

The participants reviewed and confirmed information collected and interpreted during the final interview by (Corbin, and Strauss, 2008). This allowed for creative interpretation on the part of the researcher, but maintains accuracy of the data collected from the participants (Charmaz, 2011, 2007).

Theoretical saturation was achieved by the end of the second interview, without new or emerging categories of information. Monitoring the qualities of the typologies in relation to the data categories was essential to this study by (Corbin, & Strauss, 2008). Each category achieved saturation at differing rates. A simple, weak form of a member checking with all participants-maintained consistency of data. It is in this re-analysis of the data that proves useful; making this study unique.

5 Discussion

The interview data from employees' perceptions during an organizational change process. Was collected to develop a conceptualization of unlearning using Rushmer and Davies' (2004) typologies (Rushmer, & Davies, 2004).

Participants reported that most of their unlearning experiences were of the typology of wiping with 103 total statements reflecting wiping. The results can be reviewed in Table 1.

Table 1: Results of Rushmer and Davies (2004) Typologies

Unlearning Typologies		
Category	# of References: Interview- 1	# of References: Interview- 2
Routine	0	0
Wiping	64	43
Deep Unlearning	39	13
Other	4	0

Examples of wiping include participants that describe their unlearning experiences as knowing that change was required and that this change was initiated by the organization as the system used was obsolete. An outside force present required an application upgrade. A realization that knowledge had to be changed to complete job roles was reported.

Examples of statements from participants included, Participant 2 who stated ... *"Just a lot of available information, a lot of available features and knowing that they were there and knowing that they could be accessed but not having the ability to access them. Kind of questioned my ability or felt behind the times when the company made this upgrade. And Participant 5 reported: "Well, the first thing you do is you go back to where you thought it was and then a lot of times (in the system), they changed the location or the naming of files."* Participant 9 said: *"..., I mean there are certain tasks that I would have to hunt for to figure out how to do...a lot of things that I really didn't know that the system could do... Just learned everything I needed from on-the-job training, and you pretty much learn it as you need it when your company makes the change."*

In all of these participants, wiping typology was demonstrated when the process of unlearning was initiated. Participants reported an outside force, their organization, or the Windows environment modified their job process and knowledge base in work practices.

However, 52 total quotes reflected deep unlearning with an abrupt alteration of mental models, and beliefs. Additionally, a modification in their unconscious actions with descriptions of confusion, frustration, and emotional charge during unlearning and was reported as a technological upset (Hafner, 2014). Deep unlearning, reflected beliefs about long-held work practices and processes requiring change that was a quick transformation.

Examples include: Participant 1: *"I must have accidentally hit "yes" and it downloaded the upgrade... It happened fast and I wasn't ready... and I was horrified because so many things*

went wrong. I wasn't ready to change." And Participant 2/1 explained: *"Yeah, it was really frustrating and scary so much that I didn't think I'd be able to find what to do" It changed my whole belief in my abilities."*

Participant 2/2 stated: *"I, myself, felt overwhelmed all the time. Some days you just wanted to sit and just cry and go, what did I get myself into and that kind of thing... it changed my whole feeling about the work I could do."* Participant 7 reported: *"I feel sometimes like frustrated and like desperate. There were so many changes that, like I said, unless you get used to it or know how to do it, it can be really tough. ... I know that, at the beginning, it was like a shock."*

Three factors were noted as trends, 1) outside force or some form of influence was involved to initiate the process in two typologies, 2) awareness and time for reflection about knowledge base being obsolete was needed in wiping and 3) in deep unlearning, speed of change created more emotional reactions in participants Hafner, 2015.

These forces defined new additional trends suggested by Rushmer and Davies' typologies. In all cases, a force drove the process of unlearning where the company was solely responsible for initiating the knowledge base change. As the participants were experts in their use of the current knowledge, there was no need to make changes in their knowledge base until a force or influencer was present.

Secondly, when change in knowledge base occurs, awareness and realization that change is needed where the current knowledge is no longer useable. This awareness creates a deliberate conflict which can no longer be ignored in light of current task competencies.

Thirdly, the rapid change or break from past actions or behaviors in deep unlearning occurred creating frustration and upset. The participants could no longer use the system in their job role. Concurrent with this, an emotional reaction was present during the knowledge change. Participants were more likely to express the idea that their knowledge base change questioned and disturbed their mental models, actions, and the process of task completion (Hafner, 2014).

6 Discussion

This understanding of unlearning and its unidentified typologies continue to be of value in targeted training methods and competency maintenance during the organizational change. Unlearning continues to have far-reaching implications in knowledge change processes within organizations impacting training programs, knowledge management processes, and organizational leadership strategies. Figure 2 outlines the current Unlearning model of knowledge change from a pre-existing knowledge base.

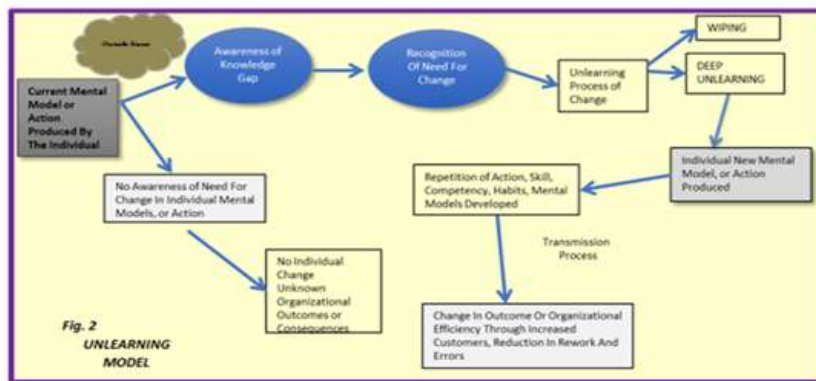


Figure 2. Updated Unlearning model 2019

The interview data from unlearning perceptions was collected to develop this conceptualization of unlearning using Rushmer and Davies' (2004) typologies. Forces whether internal or outside drive the process of individual unlearning and initiate knowledge base change. Awareness and time for reflection about knowledge base obsolence was needed to produce stability during change without upset. The model in Figure 2 suggests an updated unlearning process and provides an influencer for knowledge change.

There has been limited study regarding the processes of organizational unlearning and the unlearning involved in individuals. Literature about the unlearning process that currently exists across many disciplines, but not in enough empirically based studies. Although information regarding organizational unlearning has contributed to innovation processes, the existing knowledge about how unlearning in individuals occurs remains limited Hafner, 2015, [10]. The idea that an individual should ... "eliminate pre-existing knowledge or habits that would otherwise represent formidable barriers to new learning" has not been established (Quinn, Pascoe, Wood, & Neal, 2010).

A consistent design in terms of type of knowledge and environmental conditions to characterize unlearning has not been used. Disagreement within current literature about the type and scope of unlearning in individuals remains poorly defined especially in knowledge management of tasks involving conscious, regulatory and cognitive based knowledge change versus the automatic, routinized knowledge change type processes.

Research is recommended to focus on defining unlearning parameters. Questions such as: How and why does the knowledge change occur? What type of knowledge facilitates/detracts change? How stable is the knowledge base or is consistently in flux? How and why does change occur? Is change initiated from outside or inside influencers? What factors initiate change? Does 'forgetting' play a roele in knowledge change?

Unlearning typologies may explain and provide context of knowledge change providing organizational effectiveness. Future research should examing differening lenses using diverse participants, research methodologies with variations in the work functions, geographical

locations and rationale behind the needed change of knowledge base. Researchers possessing worthy ideas, continue to be focused on different types of unlearning without defining the specifics and parameters of the process and its environment. Continued research remains limited with complexities not presently well understood requiring further investigation.

7 Practical Application

The study results indicated unlearning is different from skill acquisition, or learning. As with all skill acquisition, the process begins with the introduction of new knowledge (Nonaka & von Krogh, 2009), however the participants were faced with a change in their current knowledge which was initiated from an outside force. Participants of this study offered some additional information about unlearning in that the process to replace existing knowledge was reported as different from normal learning with two differences found.

The first difference is that unlearning starts from prior routinized knowledge, making change difficult (Neal, et al., 2011). The second difference was that the organization and the marketplace created an impetus for change, an outside force drove the process. Interviews related how previous computer system or application was familiar and when working with these computer interfaces easy. Organizations can use this information to train and develop successful unlearners when a knowledge change is imminent.

Utilizing the results from this study, a process model can be developed allowing businesses to create effective change within their organization. A 5-step phase model would outline the process as follows: 1) Awareness, 2) Reason, 3) Tools, 4) Unlearning, and 5) Stabilization.

In step 1, the individual becomes aware of a conflict within current knowledge, the mental model, or action. In step 2, the internal discrepancy or an outside force may create the reason to initiate a change in the previous knowledge. Without this factor to drive the process, change may not be initiated.

In step 3, the individual will use the tools of experimentation to discover how to use the new information and initiate the unlearning process. For example, the participants experimented with different functions in order to decide what strategies would allow them to perform the work tasks effectively in the new computer environment. In step 4, the unlearning process is in process and knowledge is changing and in flux. When the individual is distant from the previous knowledge base and has completed the task using the new procedure, unlearning is active. Finally, in step 5, the individual repeats the new knowledge until the action or new procedure until new knowledge is stabilized and, thus replaces the previous learned knowledge. Figure 3 represents this applied model of knowledge change.

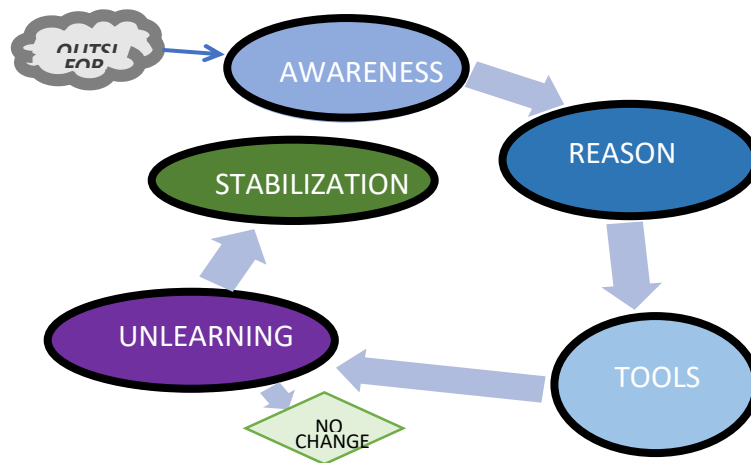


Figure 3. ARTUS Applied Unlearning Model

The results of this study point to unlearning as a process that is affected by additional forces to drive the system where the employee is undergoing unlearning. With an understanding of these factors, employees can work effectively to develop new competencies. The availability of resources and the time to take advantage of the discovery processes that are involved in experimentation can assist the employee who needs to update previous knowledge through unlearning.

As organizations and their leaders begin to increase the understanding of effective unlearning, strategies for knowledge change to develop effective skill competencies can be implemented. Unlearning factors may provide organizations strategies to improve leader training and development processes. With an improved focus on appropriate training methodology for employees, organizations can target knowledge change processes to improve employee competency. Researchers can concentrate on identification of successful unlearners and develop targeted training methods to maintain competency for organizational competitive advantage. Organizations may consider the results of this study and its practical implications for training and knowledge change processes in an organization.

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Knowledge Management

COACHING, CULTURE, AND GENERATIONAL KNOWLEDGE TRANSFER

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Abstract:

This conceptual paper will aim at discussing how coaching could be integrated into informal organizational learning and thus help the intergenerational workplace. Over the next decade, a mass exodus will be occurring as the baby boomers retire. Currently, organizations may have up to five generations working side by side. These include the Traditionalists, the Baby Boomers, Generation X, the Millennials, and possibly Generation Z. With increasing globalization in business, coaching and internal organizational collaboration have become critically important. Specifically, when members of a team are diverse in age as well as geography. As a result, leaders must decide on how to enable their staff to work successfully in an extremely fast paced and ever-changing work environment.

Keywords: coaching, intergenerational workplace, organizational learning, informal learning

INTRODUCTION

A majority of organizations are challenged by managing a multi-generational workforce and have to pay serious attention to the issue of how certain operational tasks and practices are perceived and understood by a diverse workforce mass. As the retirement of baby boomers continues, a majority of companies will be deprived of their most knowledgeable sector of

employees. [this may need to be reworded]? This often brings negative consequences to the organizational climate. Thus, to eliminate negative consequences of this process, it is critically important to secure a transfer of knowledge through the use of coaching and mentoring. By using both as tools for the successful transfer of knowledge from one generation to the next. Companies, that need to “maintain excellence” in order to remain competitive including market sustainability should seriously consider employing the use of coaching and mentoring for this purpose.

The purpose of this article is to outline how coaching and mentoring strategies can influence informal learning in regard to generational differences between co-workers. This paper consists of three sections. In the first section, the authors identified inter-generational differences between employees. The second section is devoted to the concept of coaching and mentoring in organizations. The third section offers a different perspective on organizational culture (or subculture) that might affect coaching outcomes. With the ongoing globalization of the workforce, the authors of the paper assure that the present content would be applicable not only to the North American job market, but to other global regions as well.

1. *GENERATIONAL KNOWLEDGE TRANSFER/TRANSFORMATION OF WORKFORCE*

Currently, there are significant changes in the work environment on the North American job market due to the substantial changes in workplace demographics (Burke & Ng, 2006). Lyons and Kuron (2013), define Generation as a group of individuals who experiences the similar developmental events in their youth. Generational diversity in the majority of workplaces has increased, thus aging factors play a significant role in the functionality of any organization. The pre-retired (and often retired) generation of Baby Boomers, which were born between 1943-1960, are still a large and competent workforce domain in any sector of business or industry. It needs to be pointed out that the current job market is occupied by an extraordinary number of senior employees. It is not an unusual to find that Baby Boomers are retiring much later in life (Carrière & Galarneau, 2012). Thus, the younger generation starting their career joins a workforce market that is heavily populated by at least three distinctive age groups. In addition to the Baby Boomers, these groups include Generation X, born between 1961-1980 and Millennials 1981-2000, as well as a small number of Generation Z, born after 2000.

Any new generation brings to the job-market a specific skill set, thoughts, behavior patterns, and ethical characteristics that form their overall performance and even productivity in the work place. Since a younger population of workers brings maximum changes, there is a need to pay specific attention to the most dynamic categories: Millennials and Generation Z. The active generation of Millennials often prompts provoking discussions about ethics, values and attitudes in organizational structure (Wok & Hashim, 2013). According to the “State of the American Workforce” report recently conducted by GALLUP (2017),

- Millennials are increasingly confident and ready to leave;
- only 1 in 5 employees strongly agreed that their leaders are setting good direction;
- only 15% of employees strongly agree that their leaders are making them excited about the future of their company;
- only 13 % of employees are strongly agreed that their leaders are effectively communicating with the organization;

- It is a big challenge for the workers every day to coming, being engage, and maintain expected productivity that expected by leaders;
- Only 21% of respondents agreed that their performance is managed in a way that stimulates them to do outstanding work.

The majority of Millennial workers approach their roles in a company with a highly defined set of expectations. They want their work to have meaning and purpose. Interestingly, 51 % of the workforce currently in jobs are actively searching for a new job or watching for openings. Millennials have the highest rates of unemployment, and those who hold full-time jobs often struggle to pay their bills. In opposition to Baby-Boomers and Generation-X, Millennials reported a high priority for maintaining a work-life balance and personal well-being. This is an important job aspect that influences employees' decisions to stay (or not) with a current employer. In addition, Gallup found that 68% of employees believe they are overqualified for their current job, meaning they have more education than what is required for the role. However, 45% of Millennials are more likely than both Generation-X (31%) and Baby Boomers (only 18%) to say a job that accelerates their professional or career development is 'very important' to them.

Specific attention should be paid to Generation-Z, since they will enter the global job market by 2020. According to Stillman (2017), GenZ currently represents about 72 million total. This is greater than the population of Germany. Therefore, employers cannot pretend that such a category still does not exist in the job market. This population of new workers has very unique characteristics, which were not present in any of the previous generations. According to Stillman (2017), these new-comers exist in "phigital" world, which states it is a combination of both: physical and digital. They took for granted the luxury of technology from the day they were born. Thus, coexistence in both words, physical and digital, is absolutely normal for them. The absence of truthful representation between the virtual world (presented through websites) and the real world is often perceived as unprofessional or even as 'lying to customers'. Whether "the customer" is a client and/or the employee. For example, Generation-Z want to be assured that attending a college, their perception of a digital campus is the same as a physical campus. When pictures on the web are different from the reality, then a speedy conclusion will be made: "this is not my place to be". Furthermore, if a potential employer does not have a sophisticated digital presence, that the GenZer is accustomed to, then there is a high probability that the GenZ job candidate will decline the job-offer by saying "this place is not for me". Another important factor, which makes GenZ unique, is a belief that for a successful career they do not have to go to college, since they are able to problem solve through Google. The population of GenZs are the direct product of consumer-purchasing relationships. Consequently, this philosophy significantly influences their employment choice and relationships within a specific organization. They want to be seen, and if not – they will continue their search for new employer. In these circumstances, every organization needs to rethink their strategies for transforming organizational knowledge and culture from one generation to another. Creating a coaching culture for the generations, in such circumstances, is a critical factor for organizational success.

2. THE ROLE OF COACHING IN KNOWLEDGE TRANSFER

Several factors play a role in how best to “transfer knowledge.” First, one might consider the informal learning that takes place in an organization. Second, one needs to consider the organizational culture and its openness to the generational reality. Third, and finally, the ability of those individuals who should be coaching towards the transfer of knowledge.

First, what is informal learning? Informal learning takes place every day. It is the supervisor and/or mentor taking the time to pay attention to the staff member who is struggling or who simply needs a helping hand. Taking the time to teach a new employee can help both motivate and engage that employee. The message sent by the organization is we care enough to take the time to teach you. From a developmental standpoint, this directly impacts the staff members attitude.

Gilley and Maycunich (2000) review both incidental learning as employees getting “information to do their jobs (pg. 246).” What is pointed out is the fact that employees are the ones in charge of “their own practice (pg. 246).” Moreover, developmental learning is defined as follows;

Occurs with an equal emphasis on information exchange, knowledge acquisition and practice, and transfer and integration at a high level. This kind of learning takes into account the importance of preparation, accountability, and recognition for learning and change (pg. 246).

Thus, coaching could be viewed as a construct to be used by both the organization and the individuals in the organization. From the perspective of developmental learning coaching could be two-fold. For example, a baby boomer who understands the importance of taking the time to build relationships could coach/mentor the millennial. The millennial who knows technology, could coach/mentor the baby boomer. In this way, both would be participating in the exchange and both would be contributing.

Second, how does organizational culture impact the generational reality? It begins with the definition of an organization’s culture. If an organization wants their employees to experience a positive generational reality, it will begin with leadership’s impact on respect. If leaders promote learning through coaching, then coaching will become part of their organizational culture.

There has been much discussion concerning the definition of organizational culture; some focus was given to it in the development of organizational behavior (Morey & Luthans, 1987). This suits the point the authors are trying to make. By using mentoring as a tool in promoting learning, it becomes an adapted behavior. Schein (1992) has made a distinction between the culture and organizational climate by stating that organizational culture is a much broader concept whereas climate pertains to the day-to-day environment of the workplace.

One international law firm implemented a coaching program and it showed measureable improvements in retention, challenge embracement, and professional and cultural growth (Bianco-Mathis & Schurgin, 2014). The program designated a list of ten coaches who were all experienced professionals. The program consisted of one-on-one sessions known as “coaching boot camps.” Coaches met with their coachees every month for an eight-month period. What the program did was it allowed the employees to understand the strategic and learning

direction of the firm. The program changed how their employees learned within their environment.

Through reviewing different research studies on organizational learning and compiling data it is identified that when companies encounter a crisis their behaviors go through stages. The stages are weathering the storm, unlearning, and managerial change. During the first stage, the companies try to continue operating as they had been operating, on the assumption that their troubles are caused by temporary environmental conditions. During the second stage, companies gradually discover that the environmental changes have made their past operating methods obsolete, but they have great difficulty finding and adopting new operating methods because they have become so firmly dependent on their past methods. The third stage, managerial change, is the stage that was identified to be necessary for most companies to survive social or technological environmental changes and become a gainful company again. Similarly, authors Levitt and March bring to light a variety of factors namely, that organizational learning is based on behavioral observations including;

1. That organizational behavior is based on routine.
2. That organizational actions are based on what has occurred historically.
3. That organizations are based on outcomes.

It goes on to discuss learning by doing. Competency traps are discussed as a hurdle in allowing learning organizations to move forward or adapt once they've gotten used to a particular routine. This is where coaching might be the answer.

Coaching is defined by the International Coaching Federation(ICF) as “partnering with clients in a thought-provoking and creative process that inspires them to maximize their personal and professional potential.” What this brings to mind is development, learning that in turn help to engage and motivate. Individuals who continue to learn and develop are more likely to be engaged with their jobs and with their colleagues.

Coaching is a different approach to creating and managing change. It does not seek to direct, but rather discover. This is reminiscent of an “Appreciative Inquiry” connection.

ICF has a set of core competencies that should be used in guiding the coach forward. These include four major categories. They are setting the foundation, co-creating the relationship, communicating effectively and facilitating learning. Each one of these categories has subcategories. These include;

Setting the Foundation

1. Meeting ethical and professional standards
2. Establishing the coaching agreement

Co-Creating the Relationship

3. Establishing trust and intimacy with the client
4. Coaching presence

Communicating Effectively

5. Active listening
6. Powerful questioning
7. Direct communication

Facilitating Learning and Results

8. Creating awareness
9. Designing actions

10. Planning and goal setting
11. Managing progress and accountability

Reviewing these competencies one begins to see the connection between a caring culture and a coaching culture. Having a coaching culture can help enhance organizations by building trust amongst the leadership and the staff. Building awareness, creating shifts in behavior from the perspective of the individual instead of the organization could help the well-being of all involved. At its core coaching offers both the organization and the individual an opportunity to develop, learn, and build relationships that matter. Engaged employees and teams contribute to the effectiveness of the organization.

Coaching as one with informal learning can allow the organization and the individuals that make up the organization to become more confident by creating success. The predicted changes include changes in people, changes in technology, and changes in the organization (Parsole & Leeham, 2017). These factors will consistently continue to change throughout the future, but how these changes are handled when they happen directly affects the organization. Internal coaches will need to realize how these changes will be addressed and how they will respond to meet these changing needs when the time comes.

Whether coaching baby boomers or millennials, the goal of coaching is key. By coaching, we address the individual's potential irrespective of their age or generation.

If coaching can be used as a tool for baby boomers to pass on their knowledge thereby allowing millennials to experience it. Might not the workplace culture be enhanced?

3. ORGANIZATIONAL CULTURE

Culture is one of the most challenging characteristics of a workplace. It is not easily seen nor is it written about in an employee handbook, yet leaders of successful organizations often credit culture as one of the most important drivers of success. Some even go as far as suggesting that culture will trump strategy when it comes to business outcomes. Decades of research supports the impact culture has on influencing the attitudes and behaviors of individuals within an organization. If culture sets the tone for the behaviors and attitudes of employees, how might organizations benefit from a culture supportive of realizing and unleashing individual potential while promoting collaboration amongst employees at all levels?

Today's workforce is primed with opportunities to benefit from the diversity of an intergenerational workforce. When working together as a team, "older workers can see the big picture and draw on experience while younger workers can bring a new edge to spotting trends and integrating technology" (Applewhite, 2019, p. 152). The blending of differences can lead to increased productivity and innovation through the sharing of knowledge. The key to unlocking this potential lies with breaking down intergenerational barriers and encouraging knowledge sharing within the organization at all levels.

A recent focus has been placed on the use of coaching to address the growing demands organizations are facing today. Coaching is often used as development tool for leaders and high potential employees, but recent research suggests that when coaching behaviors are embedded within an organization and used by all people at all levels, the workplace may benefit from increased job satisfaction, productivity, innovation, collaboration and teamwork (Anderson, Cylient, & Hernez-Broome, 2009; Gormley & Nieuwerburgh, 2014). By widening the scope of coaching from executives to all employees within an organization, a coaching culture is emerging as a promising strategy for addressing the needs of today's diverse workforce.

Though there is currently no universal definition of a coaching culture, a few definitions have been offered. Hawkins (2012) suggests that:

A coaching culture exists in an organization when a coaching approach is a key aspect of how the leaders, managers, and staff engage and develop all their people and engage their stakeholders, in ways that create increased individual, team, and organizational performance and shared value for all stakeholders. (p.21)

Building on a review of the literature and an effort to further research, Gormley and Nieuwerburgh (2014) offer the following definition of a coaching culture:

A coaching culture exists within an organisation when it has embedded a coaching approach as part of its strategic plans in a transparent way. Coaching cultures should motivate individuals and facilitate cooperation, collaboration and connection within the organisation and with its external stakeholders. (p. 99)

Pullen and Crane (2011) suggest that the differing definitions of coaching cultures share three common themes. These include;

1. Coaching is an accepted tool used for developing leaders.
2. Coaching skills are used by leaders for employee development.
3. Employees at all levels use coaching behaviors to interact with each other.

Any strategic change within an organization can be a daunting task. Undertaking a change in culture can be an especially difficult initiative which will require careful planning and implementation. Due to the limited research, there is no agreed upon framework for how to create a coaching culture. Hawkins (2012) and most recently, Spadafore (2019) offer a set of steps to follow for successful integration of a coaching culture. Hawkins (2012) recommends a seven step process for building coaching culture which involves:

1. Bringing in external coaches to begin with top leadership;
2. Implementing internal coaches;
3. Gaining support from leadership;
4. Moving away from formal coaching to team coaching and organizational learning;
5. Integrating coaching into performance management;
6. Establishing a management style of coaching;
7. Implementing coaching as a new way of doing business with all stakeholders.

Spadafore (2019) offers a condensed four step process to building a coaching culture which includes:

1. Understanding what coaching is and what it is not;
2. Strategically aligning coaching goals to organizational goals;

3. Gaining buy-in from leadership;
4. Using the right coaches.

Both offer a similar roadmap to creating a coaching culture. While Spadafore (2019) offers a foundation necessary to for successful implementation, Hawkins (2012) offers a more robust framework or model for undertaking such a change.

Spadafore's (2019) first step could be the key component that will set apart a successful coaching culture from an ineffective one. She stresses the importance for understanding the difference between coaching, mentoring, advising, and managing. Often times when managers are held responsible for coaching the employees, it is misconstrued as a remedial activity to improve performance. An adviser is looked to as a guide when direction is needed and a mentor is assumed to have all the answers due to already having the experience. In a true coaching relationship, the person being coached steers the coaching interactions. (Spadafore, 2019). Spadafore (2019) further argues that because research has shown that people are more likely to follow through on goals and initiatives they set themselves, adapting a coaching style behavior will set the tone for employees at all levels to take responsibility for coaching opportunities and knowledge sharing throughout the organization.

Meggison and Clutterbuck (2006) offer a four stage assessment tool for measuring progress toward creating a coaching culture. The four stages include:

1. Nascent – little to no commitment within the organization. Coaching, if present at all is inconsistent and of poor quality.
2. Tactical – the organization acknowledges the value of a coaching culture, but lacks an understanding of what a coaching culture truly is.
3. Strategic – the organization has made effort toward building a coaching culture, and while the formal coaching process is strong, the informal coaching between all employees is lacking.
4. Embedded – formal and informal coaching occurs at all levels and with all employees. At this stage, coaching behaviors are automatic and employees take the responsibility to provide feedback and share knowledge with all members of the team.

Today, organizations are facing a new reality. There isn't a place to hide. Companies are forced to adapt to the needs of the modern workforce, or they will struggle to find and keep good employees which will impact their customer service. Gallup reports rapid changing attitudes towards workplace culture: employees become customers of the job market, thus organizations have to invest significantly in order to keep and retain employees. Unhappy employees will find another place to work, and will project their unhappiness about a previous employer. "If leaders want to compete for a modern workforce, they should consider weaving some element of flexibility into their culture" (*State of the American Workforce*, 2017, p. 46).

LIMITATIONS:

At this point in time, our paper is a conceptual one and the limitations reflect a lack of applied research. Testing these concepts in the real world and seeking to gather evidence may possibly lead to grounded theory.

RECOMMENDATIONS:

Culture significantly influences how organizations function, and many studies have addressed the role of organizational culture. Historically, organizations have been studied as cultures and even subcultures. Organizations are seen to have specific cultural qualities (Weber, 1947; Parsons 1951). They have both formal and informal norms of behavior and, they create their own stories (Van Maanen & Barley, 1984; Martin et al.,1983).

Looking at the day to day and the informal learning that takes place within an organization may lend itself to further study concerning how coaching impacts employee knowledge transfer and learning.

CONCLUSION:

Both in industry and in academia knowledge transfer and coaching are constructs that continue to come up in discussions. Understanding how coaching may be advantageous in helping with the mass exodus of baby boomers would be beneficial. Industry may want to begin implementing informal coaching programs to allow intergenerational relationship building.

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Creating a knowledge-based organizational culture conducive to knowledge sharing: role of knowledge leaders

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Abstract: The characteristics of the new economy together with globalized technological and cultural advances changed organizational environments significantly. In order to stay competitive, organizations need to acknowledge the value of their knowledge assets and the necessity to become knowledge organizations to transform and adapt to these changes through knowledge management. Although there are many studies on knowledge sharing, few have examined the role of knowledge leaders and the combined effect they have on the culture of the organization. The commonality of most recent research indicates an emphasised focus on the knowledge management of information creation and sharing to create a knowledge-based organizational culture conducive to knowledge sharing. This emphasizes the role of and need for knowledge leaders for positive intervention to enhance knowledge sharing for problem solving and innovation through efforts to develop a culture of trust and commitment. Where knowledge management focuses on two main theoretical perspectives, namely human capital and knowledge-based theory, the leadership theories emphasise that leaders should acknowledge the premises of the strategic intent of the organization through the management of information, creative media strategies and environmental scanning based on trust, loyalty, integrity and credibility. Hence, it is argued that the role of knowledge leaders in knowledge management is a combination of continuous enquiry on the systems and processes of an organization as well as how the functioning of the organization can be improved through proactively and interactively managing the intellectual capital (individual and collective knowledge) under its leadership. The need for further research on these concepts provided impetus for the research problem that there is a lack of existing studies investigating the role of knowledge leaders in creating a knowledge-based organizational culture.

Keywords: knowledge management; knowledge sharing; knowledge leaders; knowledge-based organizations; organizational culture

1 Introduction

“A fruitful way of further research would be determining proper instruments based on the formulated strategies which could serve as a guideline for organizing an iterative process of navigation through the complex and dynamic system of knowledge sharing within organizations, in particular the development of effective communication instruments for managing knowledge sharing” (Block and Khvatova 2013:59).

Although organizational knowledge has been recognized as a valuable intangible resource that holds the key to competitive advantage, little progress has been made in understanding how knowledge sharing at individual level could benefit knowledge use at collective level to ensure added value. Furthermore, although leaders paid attention to the learning organization initiative, it has not been implemented in organizations and this has created the realization that knowledge management should be applied to the entire organization at all levels so as to ensure that learning takes place through knowledge creation, codification, storing and sharing. In seeking to address this gap, this study sets out with two main objectives: to critically review existing literature through an exploratory interpretivistic approach; and to propose a theoretical framework. According to Bryman and Bell (2016), interpretivism as research methodology stems from an epistemological position and refers to the critical application of analyses of various academic traditions in order to study the social world. The paper is structured as follows: key constructs, leadership, the changing organizational sphere, knowledge-based organizational culture, the role of knowledge leaders and knowledge management in the organization, theoretical framework and conclusion.

2 Key constructs

The following key constructs are prevalent in this paper.

2.1.1 Knowledge

The degree of individual knowledge is personal and based on the individual’s willingness to acquire and/or share that knowledge, a process which is difficult to manage. Individual sense making refers to the relationship between the signifier (norm) and the signified (sense) and the meaning created. This means that individuals should participate in the knowledge creation and sharing process in such a way that they interpret the world as their own understanding and in order to ensure that meaning is created to others. Knowledge can be tacit (individually owned, which is difficult to set out in tangible form), explicit (knowledge set out in tangible form at team or organizational level), implicit (information or knowledge not set out in tangible form) or cultural (sharing of knowledge through socialization or capturing it in digital form) (Koenig 2012; Choo 2002; Nonaka 1994). The process of knowledge creation and sharing articulates into innovation, which needs the exploitation and exploration of knowledge. Hence, knowledge is valued experience, skills and understanding through expert insights and contextual information that provides a framework to measure new information – such as documents and reports – available within the organization to achieve mutual benefits. The

value of the explicit form of knowledge is dependent on various dimensions such as context, usefulness and interpretation, all of which support a dichotomous view that knowledge must exist before information can be formulated and before data can be measured to form information (Freeze and Kulkarni, 2005). According to Rechberg and Syed (2014), the meaning of the word “knowledge” has been debated since 430 BC in the doctrines of Plato and since 550 BC in the lessons of Confucius. Through these teachings, we have learned that knowledge is a justified true belief (also defined as such by Nonaka 1994) and a theory or explanation, as well as an idea or form perceived by an individual. Aristotle drew a distinction between “knowing what” and “knowing how” in the fact that knowledge can be attained through an individual’s personal experience or by taking note of someone else’s experience, making individuals both the vehicle and source of knowledge (Nonaka and Takeuchi 1995). Although this classical view of knowledge is still valuable today, the modern view on knowledge is associated with competitiveness, power, knowledge as a form of asset, and participation by individuals to generate and share knowledge, as well as their consent concerning how to manage knowledge to add the organizational value inherent in the knowledge management process.

2.1.2 Knowledge management

According to Oluikpe (2012), knowledge management (KM) has generated interest at management levels due to its capability to deliver strategic results to organizations and thereby to enhance profitability, competitiveness and capacity. For the purposes of this study, the following definition of KM is proposed (adapted from Nonaka, 1994; Bounfour, 2003; Scarborough *et al*, 1999; Zack, 1999; Sunassee and Sewry, 2002; Singh and Kant, 2008; Barker, 2016):

KM refers to any process or system of creating, acquiring, capturing, sharing and using knowledge to enhance innovation and organizational performance where the KM strategy is aligned with the overall organizational strategy of the organization’s knowledge resources, capabilities and intellectual requirements through infrastructures, knowledge leaders, reward systems and innovative ideas.

The management of organizational knowledge is seen as a strategic means for organizations to improve their performance, become innovative and sustain a competitive advantage (Davenport and Prusak, 1998, Wang and Noe 2010; Bollinger and Smith, 2001; Lofti, Muktar, Ologbo and Chiemekwe, 2016). The role of KM and its processes has therefore become vital to creating a knowledge-based organizational culture to achieve competitive advantages (Nonako, 1991, 1994; Nonako and Takeuchi, 1995) where organizational culture consists of collective thinking and teamwork to enhance organizational performance (Barker 2018).

2.1.3 Knowledge sharing

Knowledge sharing is the most crucial process of KM (Gupta and Govindarajan, 2000) and is defined as the process through which explicit or tacit knowledge is communicated to other individuals to enhance organizational innovativeness and performance (Becerra-Fernandez and Sabherwal, 2010). Hence, it involves effective transfer where the recipient(s) acquire and understand the shared knowledge in such a manner that action can be taken through the utilization of knowledge without the recipient(s) necessarily internalizing the shared knowledge. According to Wu and Zhu (2012), there is no all-round definition of knowledge sharing. Hence, for the purposes of this paper the following definition has been developed (Friesl, Sackmann and Kremser, 2011; Barker 2016):

Knowledge sharing is a process in which one unit is affected by the knowledge and expertise of another unit through formal collaboration or in informal interaction. This process depends on the value of the source's knowledge, the willingness of the source to share knowledge, willingness of recipient(s) to receive and acquire knowledge and the absorptive capacity of the recipient(s) to create new knowledge in support of organization strategies.

In brief, it refers to the willingness of employees in an organization to share the knowledge they have acquired or created with their colleagues on individual or team level to enhance skills and understanding.

3 Leadership

Research indicates that the new leadership movement validates the idea that simple views of the universal validity of characteristics, behaviours or styles are not suitable for explaining the dynamics of the leadership process. To date, no leadership theory or model has been presented to provide a comprehensive and all-inclusive explanation of leadership. Many studies reflect only one philosophical viewpoint or are based on limited, even biased research, explaining limited aspects of leadership and operating as self-fulfilling prophecies (Gill, 2011). Leadership research also seems to lack the cumulative theory building that occurs in other social sciences. Probably, the main limitation is the fact that opinions on leadership are fragmented and based on the different trajectories in isolation, specifically the cognitive, behavioural, emotional, moral and spiritual aspects of human existence and the need for the creation of meaning (Gill, 2011). Goffee and Jones (2006), who argued that the traditional understanding of leadership was primarily concerned with providing meaning, also pointed this out. Furthermore, Glynn and DeJordy (2010) found that understanding how leadership infuses meaning, values and purpose is an underdeveloped and potentially fruitful area of leadership research.

Based on shortcomings of existing approaches to leadership, and since it has been argued that emerging knowledge organizations are associated with adaptive approaches, the most prominent leadership theory used in the literature is usually the transformational approach. Transformational leadership emerged in the 1980s and was first defined by Burns (1978:20) as a process in which "leaders and followers raise one another to higher levels of morality and motivation", where the process of transformation is based on empathy, understanding, insight and consideration; not manipulation, power or coercion. Notwithstanding the negative connotation of power in this sense, note should be taken that Foucault (1982) said in *Les*

Anormaux (referring to the standardization process conducted during the twentieth century), that the rule carries a claim to power and that its role is not to exclude or refuse but, on the contrary, it is always linked to a positive technique of intervention and transformation. It is also important to remember that for Foucault (1982), power relations are deeply rooted in the social nexus; but a society without power relations can only be an abstraction. According to Donate and De Pablo (2015), a distinctive type of leadership behaviour – knowledge-orientated leadership – is used for knowledge management initiatives and attracts the most universal acceptance in knowledge management literature.

Based on existing literature (inter alia Nonaka and Takeuchi, 1995; Singh 2008; Donate and de Pablo 2015; and Oliveira 2018), as well as additional viewpoints of the researcher, the main leadership styles are summarized in Table 1 to indicate the importance of a knowledge leadership perspective.

Table1: Main leadership styles

Leadership styles	Key thrusts
Traditional leaders (trait, servant, leader-member exchange, behavioral, contingency, etc.)	<ul style="list-style-type: none"> • Rationality and control to maintain organizational goals, resources, structures and people (individual independent agents) • No specific description of leadership behaviours to create high-quality relationships • Abstract definitions • No processes to address environmental changes, cultural differences, interpretation of information and strategic decision making
New leaders (charismatic, transactional, constructionist, transformational, spiritual, pragmatic, visionary, etc.)	<ul style="list-style-type: none"> • Leaders and followers raise one another to higher levels of morality and motivation • Emphasize values such as loyalty, equality, etc. • Focus on empathy, understanding, insight and consideration; not manipulation, power or coercion, but motivate and empower followers (although power can also be used as a positive intervention in transformation) • Four important skills: self-awareness, self-management, social involvement and relationship management • Leader/followers are interdependent • The role of the context is emphasised • Interpersonal leadership is a system with leadership, organizational and environmental aspects • There are rich, interdependent connections between the organization and its leader/follower members • Leaders should balance authenticity and adaptation in the context
Knowledge leaders (also referred to as knowledge-orientated leaders in some literature)	<ul style="list-style-type: none"> • Combine aspects of transformative and transactional leadership styles • Act as role models and change agents by encouraging learning, stimulate them intellectually, institutionalize learning through the provision of incentives and training, foster a pro-learning culture through cross-functional and cross-discipline engagement • Intensify <i>explorative</i> initiatives by seeking to create new knowledge • Encourage the willingness for <i>exploitation</i> practices to retain assets which aim to leverage existing knowledge through storage, transfer, sharing and application • Have a direct effect on the application of knowledge through <i>knowledge sharing</i> based on strategic integrated communication and the strategic intent of the organization • Provide strategic visions, motivate others, communicate effectively, model good practices and carry out the knowledge agenda through interdependent relationships • Religiously explain the goals of knowledge management to all concerned through interaction, vision, creativity, innovation and empowerment to create meaning • Take a participatory stance, offering interaction, trust and loyalty • Leader/follower roles are interchangeable with focus on productivity • Collaborative interpersonal relationships are central • Organizational culture conducive to transparency, empowerment and a team focus

Knowledge leadership comprises envisioning the future, coordinating the development of a coherent mission and overseeing the development, control, processes and strategic intent of the organization to provide integrated strategies, relationship building, organizational

performance, a positive organizational culture and climate (Sanghani 2009), the use of intellectual capital, especially during change, to ensure competitiveness. Singh and Kant (2008:6) emphasized the need for knowledge leadership which should be evident throughout the organization and operate on all hierarchical levels from top to bottom, and that the role of knowledge leaders is to “provide strategic visions, motivate others, effectively communicate, act as a change agent, coach other around, model good practices and carry out the knowledge agenda ... knowledge leaders should religiously explain the goals of knowledge management to all concerned”. Because knowledge management was presented as the theoretical foundation for this study, specifically the importance and role of change agents or experts (enablers) that can manage all information at all levels (individual, team and organizational), the term “knowledge leaders” has been adopted. Denrell (2005) came to the conclusion that, during the change process, (knowledge) leaders should conform to the following: empower individuals (like employees) to respond creatively; adopt personal and active attitudes towards individual and organizational goals to contribute to resonant leadership practices; be self and socially aware (and therefore be able to recognize, understand and react empathetically to their own and others’ emotions and goals); be equipped with skills such as self and relationship management (which are characterized by transparency, adaptability, collaboration and inspiration); should be associated with a supportive organizational climate due to a constructive organizational culture; have, in the change process, the role of inspiring people. This is in contrast to the traditional approaches that focus mainly on rationality and control to maintain organizational goals, resources, structures and the people involved with these.

4 Changing organizational sphere

In terms of change management, the traditional approaches such as the action research model (systematic analysis of change), the three-step change model (unfreezing moving and refreezing), and the phases of planned change approach (organizational development which focuses on processes and participation), have been criticized by authors such as Overman (1996) and Jaatinen (2002) in that they are too rigid, their phases or steps are not chronologically ordered because of changes in the environment, incremental and isolated changes are addressed rather than radical transformation, they over rely on a management approach to reduce conflict, create order, control chaos and simplify the complexities in the turbulent environment and that they will not work in all organizations. Furthermore, these authors have argued that the underlying viewpoint is that information is power which needs to be controlled, hence the need for structures. According to Oliveira (2018), organizational change may occur during complex processes such as mergers, successions, acquisitions and the like, which means that leaders should focus on the obstacles to the organization culture. Based on these viewpoints, it is argued that although these approaches were effective for many decades, the introduction of new technology, overload systems, better-informed employees and worldwide access to modernistic approaches meant that conflict or crisis usually resulted from poor planning and control. In the new leadership movement approaches – such as the chaos theory (which touched on the participatory nature of change management), complexity theory (rooted in the systems theory) and the contingency approach (role of external environment to develop congruence) – the focus shifted to dynamic environments moving away from planned change and organizational development to the management of change and transformation at a strategic organizational level. This supports the underlying purpose of this paper, which sets out to emphasize the need for knowledge-

based and strategic integrated communication with the emphasis on true and interactive participation and a holistic perspective where all systems and subsystems are integrated to create shared ownership and commitment (Barker 2016). Jaatinen (2002) made convincing arguments as to the importance of interdependence, participation and relationship building in terms of new approaches to change management. Hence, it is posited that the process of the system becomes important where all the subsystems should participate in adding to the richness of information, knowledge creation, codification and storing, shared responsibility, trust, transparency, connectivity, creativity and relationship building. This argument is supported by authors such as Grunig and Hung (2000) who indicated the importance of the concepts of control mutuality, joint acceptance of degrees of symmetry, trust and satisfaction with the relationship to communication management and relationship building. Today most organizations tend to follow a combination of the planned and emergent approaches to change management, usually based on their specific strategic goals and objectives.

5 Knowledge-based organizational culture

A knowledge-based organizational view proposes that knowledge is the strategically important resource of the organization. To build a knowledge culture in a dynamic organization, it is argued that knowledge-based organizations should transform, develop and nurture systems and processes to ensure knowledge creation, storing, codification and sharing in a meaningful way so as to expand individual knowledge (implicit) to collective organizational knowledge (explicit). This explicit knowledge can then be interpreted and applied, or used to ensure that learning is created to clarify and adapt the strategic vision of the organization during change. Nonaka and Takeuchi (1995) also refer to embodied, tacit and narrative knowledge and the “absent presence” of the body as an essential part of everyday communication because it allows for the creation and sharing of knowledge (Barker 2016). In spite of the growing interest in knowledge management, it has been critiqued by researchers such as Andreeva and Kianto (2012) for being too optimistic and promising more than it can deliver – and also because it is difficult to manage knowledge. However, Massingham (2014) addressed these concerns in an empirical study using action research from a critical systems perspective and provided empirical evidence that knowledge management can be used to manage knowledge resources (strategic integrated communication, human, monetary and information-based) and that it can be used to create a knowledge-based organizational culture. He did, however, agree that it is difficult to implement. The challenge for knowledge leaders is to develop an organizational culture conducive to the *sharing* of knowledge and where *learning* becomes the norm. While it is realized that such a culture might be a little problematic to implement, it is argued that it could encourage and support a range of positive outcomes in the dynamic changing environment and transformations of organizations. However, research has yet to reveal whether it would indeed be implementable because research-based evidence is needed to provide the expected outcomes. In spite of this, the importance of this viewpoint is re-emphasized by the growing interest in knowledge management which has, according to Oluikpe (2015, 351), “moved the topic from a relatively new discipline to an important strategic source for competitiveness”.

6 The role of knowledge leaders and knowledge management in the organization

According to Koenig (2012), the domain of “knowledge management” seems to continue its growth and attract new researchers on a continuous basis. For the purposes of this paper, the main researchers in the field, namely Nonaka and Takeuchi (1995), Davenport and Prusak (1998), Nonaka (2008), Argyris and Schon (1978) provided the context and background theories on knowledge management. The main thrust, according to them, is that knowledge management is about organizations and problems related to learning, information management and innovation, which are classical themes in most organizational studies. Hence it is argued that knowledge management is a combination of continuous enquiry on the systems and processes of an organization as well as how the functioning of the organization can be improved through proactively and interactively managing the intellectual capital under its leadership. According to Ra’ed, Gharaibeh, Tarhini and Obeidat (2015:2) this discovering of new knowledge is defined as “the development of new tacit or explicit knowledge from data and information or from the synthesis of prior knowledge ... and capturing of knowledge is defined as the process of retrieving either explicit or tacit knowledge that resides within people, artifacts of organizational entities and knowledge reside outside the organizational boundaries...”. Tacit knowledge is the skills and expertise (“know-how”) within individuals, while explicit knowledge is that which can easily be captured in documents or databases. According to Al-Alawi, Al-Marzooqi and Mohammed (2007), the process of KM involves several activities, with the most commonly discussed being knowledge sharing. Hence, studies that are more recent acknowledge the need for further research to identify the precursors that could enhance the occurrence of knowledge sharing (Mishra and Bhaskar 2011) and to study the impact of knowledge sharing on organizational performance (Mills and Smith 2012). The need for knowledge management and the importance of knowledge leaders are therefore driven by the following factors: organizational survival, competitive differentiation, globalization affects and aging workforce.

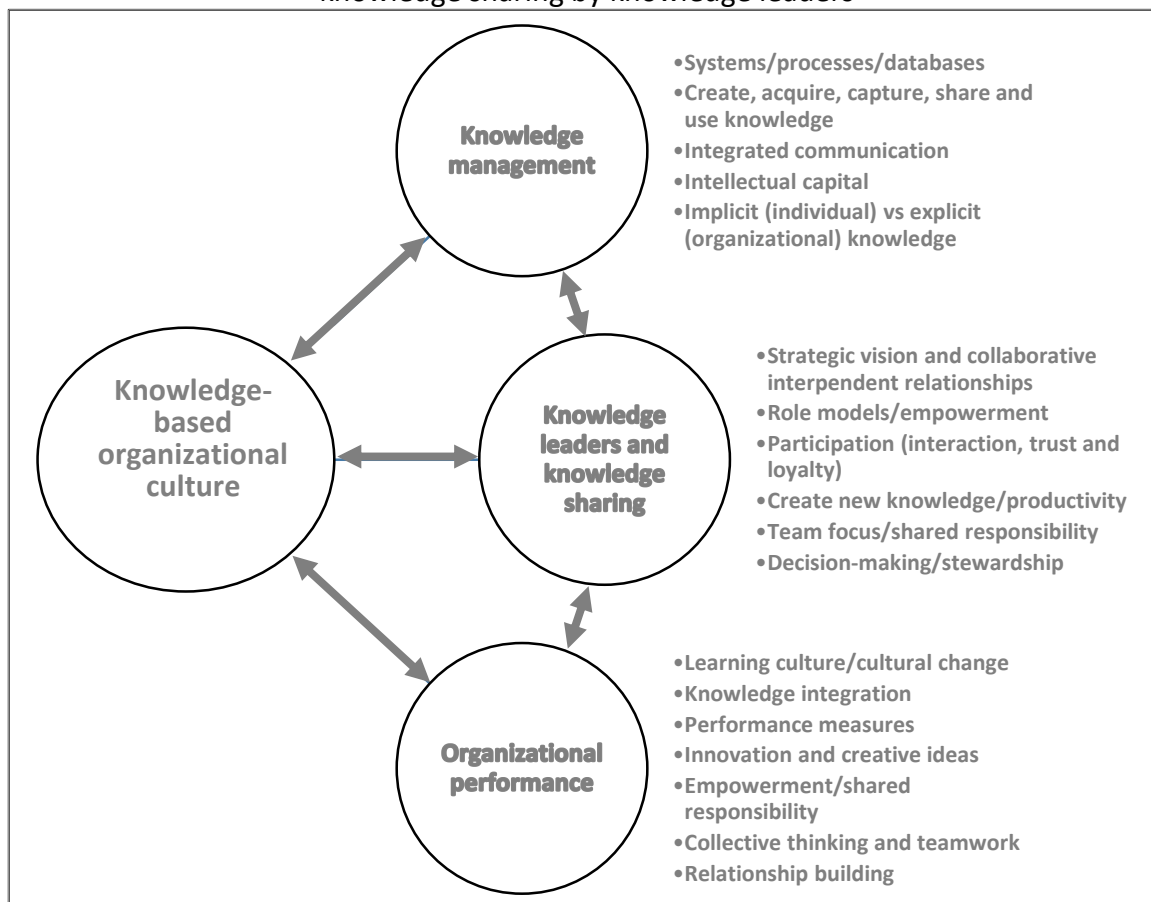
The findings in a study by Crawford (2005:14) provided evidence of a “growing interest in the relationship between the “high touch” nature of leadership and the “high tech” aspect of the workplace ... and demonstrated the link between person-centered transformational leadership and some technical construct, in this case knowledge management”. This is emphasized by Olukpe (2015) who posited that the importance of knowledge management in the organization should include both the capabilities to enable the capture and leverage of intellectual capital and the deployment of this capital to the advantage of the organization. According to Mårtensson (2000), the term “intellectual capital” is the preferred umbrella term because it refers to the possession of knowledge, applied experience, stakeholder relationships and professional skills which link to strategy. Based on the conceptual roots of intellectual capital identified by Edvinsson, Roos, Roos and Dragonettel (1997), the strategic contributions of knowledge are based on the way in which knowledge is created or developed as well as the way it is leveraged into value. In spite of this realization, knowledge creation and development is mostly examined from the learning organization perspective; whereas it is argued that, in order to create this value, there should also be a focus on “knowledge sharing” to enhance the value and, ultimately, to give an organization a sustainable competitive advantage. One major issue that has hardly been dealt with is the integration of knowledge from both perspectives where the focus shifts from individual perspectives to an emphasis on knowledge residing within the organization as a whole. For the purposes of this study, intellectual capital is linked to strategic integrated communication; human and

monetary sources needed for the processes and structures *in* the organization; and knowledge-based resources which include the management of leadership styles, technology, stakeholder relationships, innovation, creativity, participation, strategic intent and corporate culture *of* the organization. The importance of knowledge leaders in creativity, innovation, participation and organizational culture are, according to Chase (1998), the heart of creating successful knowledge-based organizations.

7 Theoretical framework

Based on the above discussion, the author constructed a new theoretical framework, as presented in Figure 2.

Figure 2: Theoretical framework for knowledge-based organizational culture conducive to knowledge sharing by knowledge leaders



From Figure 2 it may be deduced that knowledge management allows for organizational strategies based on *structural* elements including intellectual capital, systems, processes and knowledge codification and storing in databases (technical component), *connectivity* through strategic integrated communication which is knowledge-information-meaning-based (communication component) and focused on *behavioral* aspects to ensure relationship building, which should be culture-based to obtain trust, satisfaction, transparency and engagement by all (human/organizational component). It is argued that if tacit knowledge is made explicit, individual knowledge can be transferred, shared and used at all organizational levels. Due to the difficulty of transferring tacit and individually owned knowledge to explicit and organizational knowledge, the major contribution is that if knowledge leaders as change

agents apply knowledge management, it will lead to greater possibilities to manage and control this knowledge effectively, especially during change and transformation. From a strategic perspective, knowledge management is firstly about the acquisition of information, secondly about the codification and storage of this information and of the knowledge in various databases which can be used for datamining, thirdly to make the information available and accessible to all hierarchical levels in the organization and, lastly, the fact that this information should be *shared and used* through sharing, socializing, externalization and exchange of information.

Hence, it is posited that by using knowledge management, knowledge leaders can be used as role models to empower others because knowledge management can be described either as an operational tool or as a strategic tool. In order to do this, participation becomes a key element to ensure the three components of knowledge management (technical, communication and human/organizational) are implemented through connectivity, structural and behavioral constructs. This will lead to creativity and innovation, which are key elements for emerging knowledge-based organizations. It is further argued that if knowledge management is implemented in the organization during change and transformation, knowledge leaders will emerge as change agents or role models with the necessary skills to enhance decision-making, shared responsibility, relationship management and stewardship at all levels of the organization (from individual to organizational levels). This emphasizes the need for knowledge leaders to have a sound understanding of people, processes, systems, strategic visions and similar within the organization. In order to do so, these knowledge leaders should rely on integrated communication to fulfil the roles of both collaborator and catalyst. Hence, it is argued that, if these change agents or knowledge leaders respond to changes in the outside systems and borderless aggregates during transformation, knowledge-based organizations could be created. These knowledge-based organizations will then create a learning culture in line with the strategic vision through integration of both implicit and explicit knowledge. Reward systems and performance measures will become important to ensure that motivation takes place to empower people through the knowledge application or use, which will ultimately lead to cultural change. Lastly, it is argued that, in the long-term, this process will enhance the value of knowledge organizations, specifically in terms of their culture, knowledge creation and sharing to the benefit of all.

8 Conclusion

In bringing together the ideas and interrelationships of the key concepts that have been discussed, this paper attempts to contribute to the theorization of the link between knowledge management, knowledge leaders, knowledge sharing and knowledge-based organizational culture. While it is argued that the paper can be seen as useful for understanding knowledge-based organizations on a macro level, it is also important to keep in mind that knowledge itself is not directly accessible; rather it is accessed through individuals that hold knowledge at a micro level (Nonaka and Nishiguchi 2000). Hence, the focus on individual human knowledge is emphasized and should be considered by knowledge leaders through a participative approach, innovation, creative ideas, and the sharing and use of this knowledge in support of the organizational culture. Hence, the concept of “knowledge leaders” does indeed make business sense in that it can contribute to explaining how the management of knowledge is linked or related to the leadership of the organization. The need for the development of the new theoretical framework in this study, as well as its relevance, are probably best described by Gold and Arvind Malhotra (2016:186) in the following statement: “... the issues of effective knowledge management from the perspective of organizational capabilities suggests that a knowledge infrastructure consisting of technology, structure and culture along with knowledge process architecture of acquisition, conversion, application and protection are essential organizational capabilities of ‘preconditions’ for effective knowledge management”.

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Linking Transformational Leadership to Knowledge Management in the Universities in Kenya; The Role of Teamwork Processes

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ABSTRACT

This study analyses the effect of teamwork processes of cohesion and communication on the relationship between transformational leadership and knowledge management. The key objective of the study was to examine the role that various teamwork processes play in influencing a leadership knowledge management relationship in the Universities in Kenya. The study utilized the work of Yammarino et al. (2003), Muchiri et al. (2012) and Atwater and Bass (1994) on transformational leadership, performance and teamwork processes. The study also utilized Crawford (2005) research on the relationship between transformational leadership and knowledge management as well as the work of John D. Politis (2003) and Turner et al (2012) on Knowledge management and teams. Cross sectional data was collected and analyzed within a period of one year from September 2017. Descriptive statistics were used to analyze the data in order to determine the patterns and meaningful characteristics that would emerge from the data. Inferential statistics were used to determine the relationships between and among the study variables. The results obtained support the view that transformational leadership has a significant positive effect on knowledge management initiatives of creation, sharing and utilization. The teamwork processes of communication and cohesion were quite interestingly found not to significantly mediate the relationship between transformational leadership and knowledge management.

Keywords: Transformational Leadership, teamwork, knowledge management

Introduction

In today's complex work environment, incorporating teams as a sub-process of knowledge management and further supporting knowledge creation, sharing and utilization within the organization makes economic sense. Many organizations have been incorporating the use of teams at some capacity. As observed by Salas et al. (2008), although advancements have been made in team research, the field needs to keep pace with continuing demands of the workplace. Knowledge management is one such area that demands for the increased focus by researchers. From the reviewed literature, it has emerged that researchers in the knowledge management arena have barely focused on the inner workings of teams and how knowledge

management practices positively influence the performance of teams and ultimately that of firms.

Managing organizational knowledge creation, sharing and utilization is increasingly becoming an important source of competitive advantage for firms. It is also increasingly being acknowledged that the success of any knowledge management initiative depends on leaders who know how to allocate knowledge to productive use. Knowledge production and integration processes in any organization necessitate collaboration among members thus enabling Knowledge Management to facilitate the effective delivery of the right knowledge to the right people at just the right time. This study assumes that collaboration among organizational members at best happens within the teams set up. How effective or productive the collaboration is may be depended on a number of factors such as leadership and teamwork processes, which include communication, cohesion and conflict management. Many researchers have insisted that top management leadership commitment is the most critical factor for any successful Knowledge Management project, (Chong and Choi, 2005; Holsapple and Joshi, 2002). Transformational leadership has been found to be closely associated with a range of organizational outcomes pertaining to the individual followers' creativity (Gumusluoglu and Ilsev, 2009; Shin and Zhou, 2003), satisfaction and performance (Vecchio et al., 2008). Among these individual outcomes, creativity has been found to have a substantial impact on promoting organizational innovation and competitive advantage (Amabile, 1988; Oldham & Cummings, 1996; Shalley, 1991). Other studies have found a positive link between transformational leadership and outcomes given by individuals, teams as well as the firms (Avolio, 1999; Cheung and Wong 2010; Walumbwa and Muchiri, 2012).

Literature Review

Researchers have studied the concept of transformational leadership intensively in recent years and found it to be effective in terms of increasing followers' performance expectations (Bass, 1985) and transforming their personal values and self-concept into higher levels of needs and aspirations (Jung and Avolio, 2001, Kearney and Gebert, 2009). Prior research also has found evidence that transformational leadership influences teamwork processes such as cohesion and communication, leading to improved team performance and functioning (Evans and Dion, 1991; Sundstrum et al., 1990). According to Yammarino, et al. (2004) for example, Transformational leadership (i.e. the four I's) may be mapped to critical teamwork process factors in such a way as to possibly develop team communication and conflict management skills, and promote team cohesion. Transformational leadership has been empirically linked to cohesion in the past. Specifically, Carless et al. (1995) found that cohesion mediated a transformational leadership relationship with financial performance of Australian banks. Sosik et al. (1997) reported similar findings in a study where group potency was found to mediate the relationship between transformational leadership and creative outcomes of teams. Additionally, using a military sample, Bass et al. (2003) found support for the mediating role of group potency on transformational leadership performance. Furthermore, Bettenhausen's (1991) review of group research linked team cohesion with team variables that included satisfaction, productivity and member interactions.

According to previous research, the exchange of knowledge among people who enjoy harmonious interpersonal relationships should be higher (Chiu et al., 2006; Inkpen and Tsang, 2005). Storrey and Barnett (2000) in a study of failed KM initiatives suggested that knowledge is a resource with significant amount of potential, status and power and argued that any attempt to manage, control and codify organizational knowledge is likely to produce internal conflicts and turf wars as questions of who owns and controls knowledge are likely to emerge in all organizations to some extent. Scarborough and carter (2000) suggested that it is problematic to assume that organizations represent a harmonious environment where people are willing and happy to share their knowledge, reiterated this point.

Research findings point to the fact that transformational leadership positively affect team functioning. Dyer (1987) suggests that factors such as increased listening, openness to suggestions, and prompt, relevant feedback are communication-based indicators of effective team functioning. Open and easy communication within a team is critical for goal accomplishment and completion of regular, daily team activities (Zander, 1994). In their conceptual review, Swezey and Salas (1992) included communication as one of the seven primary categories that address teamwork process principles, and thus may discriminate between effective and ineffective teams. Campion et al. (1996) found that process characteristics of the teams, including communication, most strongly related to team effectiveness criteria. Chong et al. (2006) determined that transformational leaders inspire employees to make effective use of knowledge. This enables them to create new products and services for customers. A number of researchers have demonstrated that the transformational dimension of intellectual stimulation can create an environment where questioning assumptions and inventing new uses for old processes are considered a healthy form of conflict (Bass, 1985, 1990). Using intellectually stimulating behaviors such as seeking differing perspectives, suggesting new ways of looking at problems and encouraging non-traditional thinking, may promote functional, task-oriented conflict within the team (Bass,1985,1990). A leader's use of intellectual stimulation exhibits his/her belief that when teams promote and manage task conflict, the resulting innovation can lead to better team performance and decision-making (Bass and Avolio, 1994).

Waldman (1994) discussed improving multi-functional team innovation processes through reliance on transformational leadership, while Bass (1994) discussed improving team decision-making skills through the use of transformational leadership. Additionally, Atwater and Bass (1994) presented a general conceptualization of how transformational leadership may interact with and influence team factors such as cohesion and conflict management, but they did not put forth any specific, testable propositions. Many of the reviewed studies on the influence of transformational leadership on teams did not establish the intermediate team processes, which enable transformational leadership to exert a positive influence through employee inspiration and motivation. Following the demonstrated linkages between transformational leadership, teamwork processes and performance, as well as the identified research gaps in the conceptualized relationships, the following hypotheses were developed for this study;

H1. Transformational Leadership has a positive influence on Knowledge management

H1.1 Transformational leadership has a positive influence on teamwork processes of cohesion and communication

H1.2. The teamwork processes of cohesion and communication have a mediating influence on the relationship between transformational leadership and knowledge management.

A conceptual model highlighting the hypothesized relationships was developed. The conceptualized model rests on the premise that in addition to previously supported direct transformational leadership-Knowledge Management linkages (Crawford 2005), the four dimensions of transformational leadership may produce key intermediate outcomes, which could positively influence team interpersonal processes of cohesion and communication. The product of these interactions may in turn influence Knowledge management initiatives of creation, sharing and utilization. The model is presented in figure 1.

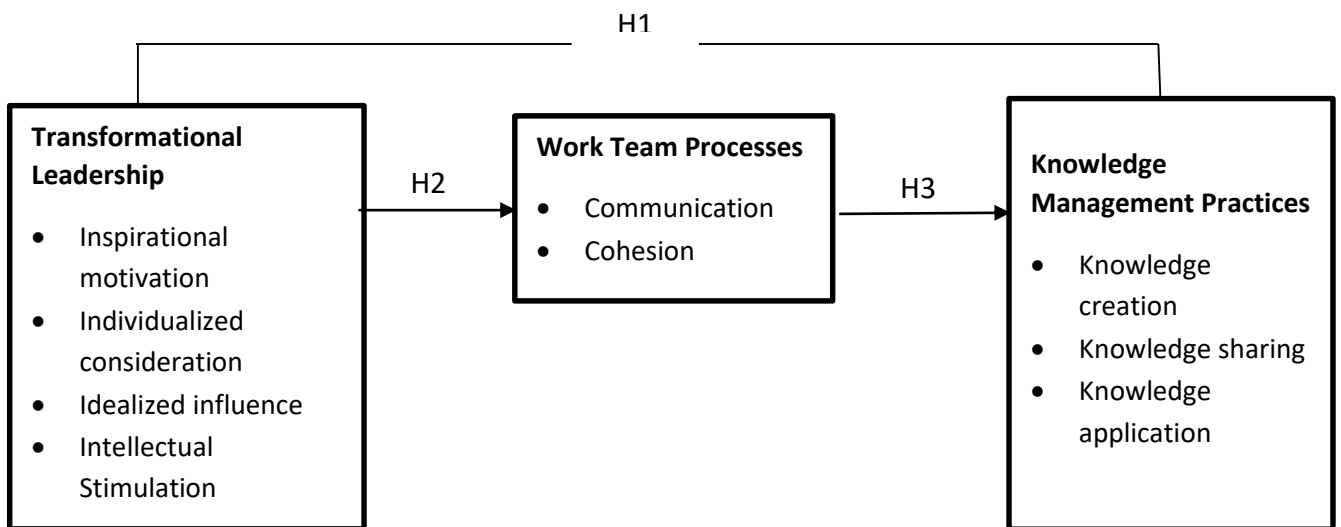


Figure 1. A conceptual model depicting the relationship between Transformational leadership, teamwork processes and knowledge management

Research Methodology

This study was undertaken in three steps. The first step was to identify characteristics of transformational leadership from the Multi Leadership Questionnaire (MLQ) developed by Bass and Avolio (1995). The second step was to come up with a list of teamwork processes from literature. Two key teamwork processes of cohesion and communication were derived from a list of seven primary categories as adapted from a conceptual framework developed by Swezey and Salas (1992). The third step was to review the knowledge management practices identified from literature for their relevance in the Kenyan University situation. The knowledge management practices of creation, sharing and utilization were derived from literature.

Relevant survey instruments were developed to enable data collection. These were captured in a three-section questionnaire. The first section focused on the transformational leadership characteristics as identified from the multi leadership questionnaire. The section listed a number of statements reflecting transformational leadership characteristics measured in a

five point Likert scale, ranging from strongly disagree(1) to strongly agree(5). The second section of the questionnaire captured statements aimed at determining the perceived effect of the leadership behaviors on the two identified teamwork processes of cohesion and communication. The last section of the questionnaire included statements that reflect the different KM practices adopted and implemented in the universities in Kenya.

In line with the requirement of the National Commission for Science and Technology (NACOSTI), a request was sent for approval to collect data from public and private Universities in Kenya. After receiving the approval, an official letter was sent to six Universities, inviting them to participate in the study. Kenya has 30 accredited Universities. Simple random sampling was used to select six universities for the study. Six Universities represent a 20% industry representation, which is considered adequate for a cross sectional study, Mugenda and Mugenda (2006). A questionnaire was sent via email to the heads of academic departments of the selected Universities. Sixty (60) questionnaires were sent out, 36 of the returned ones were found usable for data analysis. Before data could be collected, research instruments were subjected to diagnostic tests. To determine reliability of the instruments, Cronbach alpha method was used with an alpha coefficient of 0.6 as the minimum acceptable threshold. Results of tests of reliability indicated that all the items had an alpha coefficient ranging from 0.7 for teamwork processes and 0.9 for both transformational leadership and knowledge management. All the items satisfied the minimum threshold of 0.6 and were therefore accepted.

Table 1: Results of Reliability tests

Variable	No of items	Cronbach's Coefficient	Conclusion
Transformational Leadership	18	0.9	Accepted
Knowledge Management	29	0.9	Accepted
Work Team Communication	13	0.7	Accepted

The collected data was analyzed using descriptive statistics such as mean and standard deviation as well as inferential statics such as linear regression. Descriptive statistics were used to describe characteristics of the data obtained while inferential statistics were used to determine the nature of the relationships between and among the study variables. The study sought to determine the extent to which University leaders exhibit attributes of transformational leadership and the extent to which these attributes influence teamwork processes of cohesion and communication. Respondents were requested to indicate the extent to which characteristics of individualized consideration, intellectual stimulation, inspiration motivation and idealized influence described the leadership structure in their universities on a five point Likert scale ranging from “strongly disagree” (1) to “strongly agree”(5). Four items were used to measure individualized consideration, (e.g. “Our leader promotes development of individuals”), five items were used to measure intellectual stimulation (e.g. “our leader encourages employees to solve problems”), four items measured inspirational motivation (e.g. “our leader creates optimism among the employees”) and four items were used to measure idealized influence (e. g “our leader uses power for positive gain”)

Items adapted from Fillius and De Jong, (2000) were used to measure the three knowledge management dimensions. Twelve items were used to measure Knowledge creation (e.g. “there is an active involvement of the members in external professional work and associations”), knowledge sharing was measured using six item (e.g. “members are able to discuss their methods of working during internal review briefs and meetings”) and knowledge utilization as measured using seven items e.g. “experiences of clients are used to improve products and services”. Teamwork processes was measured using items developed from literature review. Work team communication was measured using six item such as “giving feedback is encouraged at all levels” while teamwork cohesion was measured using seven items, (e.g.” team members are always working towards the same goals and targets”)

Table 2; Descriptive Statistics

Variable	Mean	SD
Transformational Leadership	3.9	1.0
Knowledge Management	3.6	1.06
Teamwork Processes	3.9	0.9

N=36

Transformation Leadership and Knowledge Management

To test the effect of transformational leadership on knowledge management, the following regression was run; $Y = \beta_0 + \beta_1 X_1 + e$. Where Y = Transformational Leadership, β_0 = intercept, β_1 =regression coefficient, X_1 = knowledge management. The results presented in table 3 show that transformational leadership explains 48 per cent of the variance in knowledge management.

Table 3. Model Summary for Transformation Leadership and Knowledge Management

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.693a	0.48	0.465	0.731

- a. Predictors: (Constant), Transformation Leadership
- b. Dependent Variable: Knowledge Management

Analysis of variance results in table 4 show that the model is significant for predicting knowledge management. $F = 31.44$, $p \leq 0.05$

Table 4. ANOVA for Transformation Leadership and Knowledge Management

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.815	1	16.815	31.44	.000a
	Residual	18.185	34	0.535		
	Total	35	35			

- a. Predictors: (Constant), Transformation Leadership
- b. Dependent Variable: Knowledge Management

The results in table 5 show that the coefficients β_1 (knowledge management) is both positive and significant, $\beta_1=0.693$, $t=5.607$. These results support the study's proposition that transformational leadership has a significant influence on knowledge management

Table 5 Regression coefficients for Transformation Leadership and Knowledge Management

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.07E-16	0.122		0.00	1
	Transformation Leadership	0.693	0.124	0.693	5.607	0.000

- a. predictor Variable: Transformational Leadership
- b. Dependent Variable: Knowledge Management

Transformational Leadership and teamwork processes

To test the effect of transformational leadership on teamwork processes, the following regression model was run; $Y = \beta_0 + \beta_2 X_2 + e$. Where Y = Transformational Leadership, β_0 = intercept, β_2 =regression coefficient for teamwork processes, X_2 = Teamwork processes

The results presented in Table 6 show that transformational leadership explains 53 per cent of the variance in team work processes, $r^2= 0.053$

Table 6 .Model Summary for the Relationship between Transformation Leadership and Team Work processes

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.230a	0.053	0.025	0.98751

- a. Dependent Variable: Teamwork processes

b. Predictors: (Constant), Transformation Leadership

Analysis of variance in table 7 shows that the model is significant (F= 1.891). These results support the study's hypotheses that transformational leadership has a significant influence on teamwork processes.

Table 7. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.844	1	1.844	1.891	.178a
	Residual	33.156	34	0.975		
	Total	35	35			

a. Predictors: (Constant), Transformation Leadership

b. Dependent Variable: Team work Processes

The results in table 8 indicate that the coefficients β_2 (Teamwork processes) is both positive and significant, $\beta_2=0.23$, indicating the amount of change in teamwork processes that is attributable to transformational leadership, $t=1.375$, $p \leq 0.05$

Table 8. Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.16E-16	0.165		.0000	1
	Transformation Leadership	0.23	0.167	0.23	1.375	0.18

a. Dependent Variable: Work Team Process

b. Independent variable: Transformational Leadership

Relationship between Teamwork Processes and Knowledge Management

To test the effect of teamwork processes on knowledge management, the following regression model was run; $Y = \beta_0 + \beta_3 X_3 + e$. Where Y = knowledge management, β_0 = intercept, β_3 = regression coefficient for teamwork processes, X_3 = Teamwork processes as the predictor variable. The results which are presented in table 9 show that teamwork processes explain 63 per cent of the variance in knowledge management $r^2 = 0.063$.

Table 9 .Model Summary for the effect of teamwork processes on knowledge management.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.251a	0.063	0.035	0.982181

- a. Predictors: (Constant), Work Team Process
- b. Dependent Variable: Knowledge Management

Analysis of variance in table 10 show that the model is significant (F= 2.281). These results support the study's proposition that teamwork processes predict knowledge management.

Table 10. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.201	1	2.201	2.281	.140a
	Residual	32.799	34	0.965		
	Total	35	35			

- a. Predictors: (Constant), Work Team Process
- b. Dependent Variable: Knowledge Management

The results in table 11 show that the coefficient β_3 (knowledge management) is both positive and significant, $\beta_3=0.251$, indicating the amount of change in knowledge management that is attributable to team work process, $t=1.51$, $p\leq 0.05$.

Table 11; Regression Coefficient

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-8.88E-17	0.164		0.00	1
	Work Team Process	0.251	0.166	0.251	1.51	0.14

- a. Predictors: (Constant), Work Team Process
- b. Dependent Variable: Knowledge Management

Transformational Leadership, teamwork processes and knowledge management

To determine whether transformational leadership predicts knowledge management through teamwork processes, stepwise regression model proposed by Baron and Kenny (1986) and Kenny et al (1997) was run. The results are presented in table 12, 13 and 14.

Results of regression analysis in table 12 show that transformational leadership and teamwork processes together explain 48.9 per cent of the variance in knowledge management, $r^2= 0.489$

Table 12. Model Summary for the effect of teamwork processes on the relationship between transformational leadership and knowledge management.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.700a	0.489	0.458	0.735965

a. Predictors: (Constant), Work Team Process, Transformation Leadership

b. Dependent Variable: Knowledge Management

Analysis of variance in table 13 show that the model is significant (F= 15.809) for predicting knowledge management.

Table 13. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.126	2	8.563	15.809	.000a
	Residual	17.874	33	0.542		
	Total	35	35			

a. Predictors: (Constant), Work Team Process, Transformation Leadership

b. Dependent Variable: Knowledge Management

The results in table 14 show that when teamwork processes is added to the model, the beta coefficient for knowledge management reduces significantly from 0.671 to 0.097, the t statistic changes from t= 5.25 to t=0.76 . The model becomes insignificant $p \geq 0.05$. From these results, hypothesis 1.2 which states that teamwork processes mediate the relationship between transformational leadership and knowledge management is not supported.

Table 14. Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.18E-16	0.123		.000	1
	Transformation Leadership	0.671	0.128	0.671	5.25	0.00
	Work Team Process	0.097	0.128	0.097	0.76	0.45

a. Dependent Variable: Knowledge Management

b. Independent Variable; Transformational leadership

Conclusions, Recommendations and limitations

The current study examines the relationship between transformational leadership and knowledge management in the Kenyan Universities. The mediating role of teamwork processes in the relationship is also explored. Prior research found evidence that

transformational leadership positively influences teamwork processes, leading to improvements in team performance, and functioning (Sosik et al.1997; Yammarino, et al.2004). Extant studies regarding the influence of transformational leadership on knowledge management though limited determines it to be positive (Crawford, 2005). Studies seeking to determine the intermediate team processes which explain the positive influence of transformational leadership on firm outcomes including a firms knowledge management initiatives are very limited.

The results of this study supported the view that transformational leadership has a positive influence on teamwork processes. The results further determined that transformational leadership has a significant positive influence on knowledge management. Teamwork processes however were found to have no significant mediating influence on the relationship between transformational leadership and knowledge management. This was quite interesting since prior research has found teamwork processes to positively predict firm outcomes with transformational leadership as the predictor variable (Walumbwa and Muchiri, 2012, Yamarinno, 2005). One possible explanation for these results could be the choice of teamwork processes used for the study. Further research incorporating more teamwork variables is therefore recommended. Cultural context may also be a factor that may have influenced the findings. Most of the studies referred to in this paper are based in western countries contexts which have different cultural value systems that influence group functioning. This research study is based in a cultural context characterized by collectivism, which emphasizes harmony and close interpersonal ties. As such, interpersonal communication and cohesiveness are intertwined in the daily existence of the societies. This may have influenced the study findings. Such a conclusion however is subject to validation by future research studies. It is also important to note that the findings show that teamwork processes by themselves account for 63% of the variance in knowledge management while transformational leadership accounts for 48% of the variance individually. This implies that Transformational Leadership may not be a very critical element if an organization has highly cohesive teams and good communication.

This study has theoretical implications. Firstly, the results showed that transformational leadership has a positive effect on knowledge management practices. This is consistent with the underpinnings of the transformational leadership theory that transformational leaders inspire, motivate and empower followers to higher levels of performance. The findings are also consistent with Crawford (2005) and Turner et al.(2012),who determined the influence of transformational leadership on knowledge management to be positive. Thirdly, the hypothesized mediating influence of teamwork processes in the relationship between transformational leadership and knowledge management was not confirmed. Further research is needed to determine the specific teamwork processes and their combined and individual effect on the relationship between transformational leadership and knowledge management. Future research may also determine the possible role of culture on the relationship.

One limitation of this study is that this is an initial attempt at understanding how transformational behavior may influence Knowledge Management performance via teamwork processes. Out of the studies reviewed, none has attempted to link the transformational leadership style to knowledge management through teamwork processes. Further research is therefore needed to validate the findings of this study. Although up to seven teamwork processes have been identified in literature, only two were considered for

this study. This may have influenced and limited the study findings. Future research is recommended to provide more clarity on these relationships.

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Reality...and Knowledge and Data Models

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Abstract: Models in Artificial Intelligence and Data Base Technology are subject to criticism for being invalid, rigid and too rigorous. This is due to inherently limiting assumptions that variables and their relations are by nature quantitative, have predefined categories and that reality is describable through singular conditional statements with an absolute status. Another questioned assumption is the conception that that are inductively constructed acceptance generalisations are acceptable in the context of discovery. These assumptions belong to *the information processing paradigm* and they carry the deeper implication that reality has to be forced into mathematical models, algorithms and knowledge and data representation formalisms. Accumulating evidence and theoretical analysis reveal that a quantitative approach is not always appropriate, that fixed categories might be oversimplifications leading to exceptions, that reality is highly conditional and finally that inductive discovery can be 'an optical illusion'. In this article we review the assumptions and discuss *the functional paradigm* as a promising alternative to design realistic models. Various forms of theoretical and practical progress will illustrate the potentials of the functional paradigm in advanced data processing and a new generation of artificial intelligent machines.

Keywords: data models, knowledge models, entropy, machine learning, functional paradigm

1. Reality, paradigms and models

Reality has an infinite amount of different sized elements and complex interactions. It is not reducible to a model with exact parallelism. At best, a model is an approximation with just sufficient correspondence with reality for its targets with respect to description, explanation and prediction. But if a model is a simplification of reality, how do we decide that a model T_2 is a better model than T_1 ? Which criteria determine to prefer one theory over the other? Or is the evaluation of a model an arbitrary operation?

A possibility for a theory T_2 to criticise T_1 , is *the qualitative amendment of data*. Data that fits the T_1 model is re-classified by the new model. An example is the stone that falls from a tower. T_1 , the Aristotelian theory interprets the stone not ending up hundreds of meters from the foot of the tower, following a straight line, as a confirmation that the earth does not move. T_2 , the Galilean view, claims that the movement of the tower is kept in the stone (later this idea evolved to the impetus theory) implying that the stone falls according to a bended line. Both paradigms acknowledge the same sensory data, but provide different explanations. The merit of T_2 is that it reveals that the interpretation of T_1 is not as self-evident and natural as originally assumed.

If T_2 can also explain new facts that are contrary to T_1 , T_2 achieves *a practical success* over T_1 . Examples are the solar spots, appearances of Venus (to denote that Venus circles around the sun) and the moons of Jupiter (to denote that the moon 'accompanies' the earth in its yearly

rotation around the sun). These observations were all new facts (opposing T_1) and practical successes of the Galilean view

Another reason to shift to T_2 is *a quantitative amendment*. T_2 reveals that the facts of T_1 are wrong and need to be removed from the empirical evidence of T_1 . The stars were considered not so far and the consequence of not observing the parallax (shift in apparent position of an object viewed from different positions) was considered a confirmation that the earth did not move. Galileo based his view on a moving earth and sought to explain the parallax not being observable in a larger distance of the stars removing the 'fact' that the distance of the stars was not that large.

A theoretical success is the achievement of theoretical facts: Galileo explained the tidal movements as a consequence of the 3 movements of the earth. While defending the Copernican view, only his theory could explain the phenomenon of the tidal movements (at that moment).

The 4 possibilities for model selection (Derksen 1980, Newton-Smith 2003) show the importance of a paradigm and the theory dependency of facts. Similar to scientific progress achieved by moving from the Aristotelian view to the Galilean view, from Newtonian mechanics to relativistic mechanics and other paradigm shifts, this article strives to progress Artificial Intelligence (AI) and Data Base Technology (DBT) by a shift from the information processing paradigm to the functional paradigm.

2. Models in Artificial Intelligence and Data Base Technology

Machine learning and knowledge representation formalisms progressively enable AI systems to perform tasks that involve intelligence and for a number of decades record-based information models form the backbone of industry. The general mode of operation is that AI focuses on intensional logic (conditionality), whereas extensional logic (data) occupies centre stage in DBT. The models that allow these technologies to do their work are engineered by humans or automatically produced as in machine learning.

Data modelling and machine learning have been subject to criticism. Kent (2012) and Marcus (2018), for example, contributed to this criticism. Kent by describing the gap between reality and data models and Marcus by contrasting the flexibility of human learning against the rigidity of deep learning. Kent formulates his criticism as follows: 'These [data] structures give us useful ways to deal with information, but they don't always fit naturally, and sometimes not at all. Like different kinds of maps, each kind of structure has its strengths and weaknesses, serving different purposes, and appealing to different people in different situations. Data structures are artificial formalisms. They differ from information in the same sense that grammars do not describe the way we think.' (Kent 2012). Marcus lists the following challenges of deep learning: ineffective learning capabilities of abstractions, limited capacity to transfer to scenario's that differ in minor ways from particular training scenarios, lack of dealing with hierarchical structures in natural ways, struggle with drawing open-ended inferences, lack of transparency, the mixing up correlation and causation, the assumption of a stable world, lack of incorporation of prior knowledge and the difficulty to engineer with deep learning (Marcus 2018). This article is a critical review from *a functional perspective* of the assumptions underlying the models in AI and DBT.

2.1. On the first assumption: variables are quantitative by nature

Physics is considered the most fundamental science and as such executes a profound effect on other sciences. Statistical mechanics, a branch of physics and chemistry, is an example

Time (s)	Distance (ft)	Speed(ft/s)
0	0	0
1	16	16
2	64	48
3	144	96
4	256	144
5	400	192
6	576	240

where the description of motion from physics is applied to molecules to compute entropy. Entropy is also applied in machine learning to induce trees. The procedure of *precisely* defining motion is described below (Feynman 1965).

Table 1: Observations falling ball

Table 1 shows observations of a falling ball with respect to time, distance and its speed at a particular second. The model to define speed uses the ratio of the difference of distance (d)

$$\text{Speed at } t_2 = \frac{d_2 - d_1}{t_2 - t_1}$$

and time (t):

We see in the table that according to this model in the 5th second the speed is 144 ft/s. This is, however, *an average speed* in the time interval of 1 second *before* the 5th second. We know from the intensional definition $d = 16t^2$ that the ball is speeding up and is going faster than 144 ft/s at the 5th second. To define speed at an exact point in time, we can calculate the

$$(A) \text{ Speed at } t_5 = \frac{16(5+0.1)^2 - 400}{(5+0.1) - 5} = \frac{416.16 - 400}{5.1 - 5} = \frac{16.16}{0.1} = 161.6 \text{ ft/s}$$

distance the ball has gone in 1/10th of a second *after* second 5, $d = (5.1)^2 = 416.16$.

This is also not precise. Is it the speed at 5 seconds or at 5.1. second or somewhere else in the

$$(B) \text{ Speed at } t_5 = \frac{16(5+0.001)^2 - 400}{(5+0.001) - 5} = \frac{400.160016 - 400}{5.001 - 5} = \frac{0.160016}{0.001} = 160.016 \text{ ft/s}$$

interval? More precise is:

As this is still not exact and we do not want to go on like this, we take another approach and make both differences infinitely small using the concept of an infinitesimal time and

corresponding infinitesimal distance as defined by Leibniz and Newton. The extra little bit of

$$(C) \text{ Speed at } t_s = \frac{16(5+\epsilon)^2 - 400}{(5+\epsilon) - 5} = \frac{400 + 160\epsilon + 16\epsilon^2 - 400}{\epsilon} = \frac{160\epsilon + 16\epsilon^2}{\epsilon} = 160 + 16\epsilon = 160 \text{ ft/s}$$

time carries the implication that it can be smaller and smaller, but will never reach 0.

This is the exact speed leading to the differentiated intensional definition $d = 32t$. Speed is the derivative of distance with respect to time. This process of differential calculus has stimulated quantitative approaches in other sciences together with the conception that all statements can be expressed 'in terms of observable characteristics of physical objects'. Ideas from physics have transferred to machine learning and econometrics which is manifest in

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k + u$$

algebraic models.

Economists and assume that the regression model is true for the entire population and that variables are independent. It is additionally assumed that the error term captures the impact of other factors and that u is independent of the regressors (assumption of exogeneity). The variables and their categories are a priori, almost synthetical knowledge independent of empirical evidence. This looks like mathematics that is not a natural science in the sense that test of its validity is not experiment. A difference is that it will be tested after feeding empirical observations to design the model through estimating weights and minimising the sum of

$$Y = \beta_0 + \beta_1 x_1 \text{ where } \beta_0 = \bar{y} - \beta_1 \bar{x} \text{ and } \beta_1 = \frac{\sum \Delta x_i \Delta y_i}{\sum (\Delta x_i)^2}$$

squared residuals.

x	y	delta x	delta y	delta x * delta y	delta x^2	model	residu	residu^2
2	2	6.429	2.143	13.776	41.327	2.020	0.071	0.005
4	2	4.429	2.143	12.018	19.612	2.618	1.618	2.617
5	6	2.429	0.957	2.020	11.755	2.062	2.020	4.152
8	4	0.429	1.143	0.490	0.184	4.006	0.006	0.004
12	6	2.571	0.957	2.061	12.755	6.274	0.274	0.140
12	0	4.571	2.957	17.622	20.888	6.718	2.282	5.207
15	6	6.571	0.957	5.622	42.194	7.107	1.107	1.090
8.429	5.143			51.571	149.714			15.002

Using the observations of Table 2 for 1 explaining variable and no error term gives the

$$Y = (5.143 - \frac{51.571}{149.714} * 8.429 + \frac{51.571}{149.714}) * X_1 = 2.24 + 0.344X_1$$

following model:

So for $x_i = 2$ the model predicts: $2.24 + 0.344*2 = 2.929$.

Table 2: Data set for modelling

The model prediction differs from the data. While using the derivatives of 1 with respect to

x	y	delta x	delta y	delta x*delta y	delta x^2	model	residu	residu^2
1	4	0.714	88.430	228.440	12.706	24.015	20.015	000.022
2	16	0.714	76.430	207.440	7.267	65.701	40.701	2470.116
4	25	0.714	67.430	48.162	0.510	120.241	104.241	10897.12
5	64	0.286	28.430	8.122	0.082	161.117	07.117	0421.675
6	144	1.286	51.571	66.206	1.652	102.802	48.802	2200.145
7	160	0.286	76.571	175.020	5.224	224.660	55.660	2000.075
8	225	0.286	122.571	425.502	10.706	256.442	21.442	088.656
4.714	82.430			1252.857	20.430			20176.82

both unknown parameters, the Ordinary Least Square method tries to draw a line that fits best with the examples, but the related assumptions do not seem to hold. An assumption is that the behaviour of the population can be described by the regression equation. But even if the perfect intentionally created data of the falling ball is applied, differences are seen (Table 3). The physical relation between time, distance is not the same as the relation between the regressor and prediction in this bi-variate algebraic model. It is based on extension rather than a formal intension of the definition of velocity based .

Table 3: Data set modelling falling ball

The slope parameters are weights which cannot reflect conceptual interactions (see 2.2) and using observations they are estimated and differentiated. But reality does not let itself always be defined in purely quantitative terms. What happens here is in many ways different from the calculation of speed especially since this way of modelling is applied to domains that are not very well describable quantitatively. Think of the areas where regression is used and try to see them reducible to an algebraic model assuming independencies between the variables and between the variables and the error-term ignoring conceptual and other interactions, but assuming additivity, multiplicativity and statistical interaction.

2.2. On the second assumption: fixed categories will do the job

When designing a model, there is no escape assigning objects to what they are, to a certain category. In data models, for example, an account can be a 'Savings account' or a 'Checking account'. Note that when an individual is stated to belong to a category, the operation is called an instantiation. When a sub-type is classified as a super-type type, we call it a generalisation or a universally quantified conditional. Data models assume that categorisations are given, undisputed and stable. A value of an object in the predefined field 'Savings account' equals the statement 'this object is a savings account'. From an ontological perspective, the statement is considered true, thus as a fact about the object. The object does not need to match a set of conditions that defines 'Savings account'. It is a universal quantification, however, one that will appear not so universal.

Category membership of objects is often debatable. Almost all non-trivial categories have not well-delineated boundaries. Arbitrary instantiations or the implicit existence of local and hidden classification rules in applications render category membership unclear. Consider the 'well-understood' category of 'client' or 'employee'. The category of a thing, what it is, might be determined in infinite contexts. It can be its position in time and space. On the symbol level, traditionally entity types and record types are considered to coincide, but it is a matter of choice whether a piece of information is to be treated as an attribute, category or a relationship which raises the question how fundamental such a distinction in DBT is. Are discussions, for example, whether we have to do with grouping or typing very relevant or do they distract from the original objective: modelling reality. In general horizontal homogeneity and vertical homogeneity are assumed respectively presupposing that the same attributes are relevant for each object and that each attributes has the same intension (Kent 1979). To a certain degree, exceptions are allowed in classifications. One way to do this is through null values. They appear as a blank in a field independently of its datatype. The blank is displayed through Null. Another way is the relaxation of the meaning of a category and enable object values that do not belong to the category carrying the implication of an implicit change in semantics. To solve the contextual problem, it helps to specify that maiden name is applicable to all things that are employee and which are of the female gender and which have been married (Kent 2012). The importance of intensions is also stressed by Brachman (1985) and Lucardie (2018).

The assumption of predefined categories in machine learning similarly surfaces in the use of mathematical techniques. An example is entropy that is applied to induce decision trees from a dataset. Entropy emerged from the various formulations of the Second Law of Thermodynamics where it was defined as an always increasing physical quantity in terms of heat and energy. Boltzmann provided an interpretation of entropy as the nature's way of proceeding from order to disorder quantity that always *increases* with time, and that remains constant once the system reaches thermal equilibrium (which we will see is debatable).

Target variable	v	
Categorical target variable	1	2
Frequency category in dataset	6	5
Probability events 1 and 2	6/11 = 0.54	5/11 = 0.46
Entropy events 1 and 2	0.54 * log 0.54 = 0.412	0.46 * log 0.46 = 0.520
Entropy (X) (summation entropy events)	0.412 + 0.520 = 0.932	

Entropy is considered as one the most effective mathematical techniques for decision tree

$$Entropy(X) = - \sum_{i=1}^{inf} p(x_i) * \log p(x_i)$$

where $p(x_i)$ is the probability of event x_i

induction. The formula for entropy is:

Table 4 shows how to compute the entropy of a (binary) target variable X in the data set. Computing this base entropy is the first step in decision tree induction.

Table 4: Computation base entropy

message	encoding		probability distribution	
	1	2	case 1	case 2
A	00	0	100%	50%
B	10	10	100%	25%
C	11	110	100%	12.5%
D	111	111	100%	12.5%

The logarithmic base. Apart from the structural limitations inherently attached to machine learning -the impossibility of induction in the context of discovery and the absence of human flexibility- the choice of the logarithmic base deserves attention. A main reason is mathematical convenience. In his paper 'A Mathematical Theory of Communication' Shannon introduced the concept of information entropy and argued that 'A device with two stable positions, such as a relay or a flip-flop circuit, can store one bit of information. N such devices can store N bits, since the total number of possible states is 2^N and $\log_2 2^N = N$ ' and further that 'Many of the limiting operations are simple in terms of the logarithm but would require clumsy restatement in terms of the number of possibilities' (Shannon 1948).

Table 5: Messages, encodings and probabilities

In encoding 1 message 'C' is represented by the 2 bits: 11. That is a unique identification, but it can be ambiguous when multiple encodings are sent after each other. For example, if we use the 5-bit value '11111' it can mean CD or DC. Encoding 2 is non-ambiguous. Note that for message 'A' the 2nd bit is removed as it is superfluous.

The goal of information entropy is to find the smallest average encoding size without information loss. The probability of an event plays a role in this. If a certain event has a high probability, it can be considered to use '0'. One way to find the smallest average coding size is trial and error and juggle around with the bits. Another method is using the logarithmic function.

$$-\log_2 P(A) = -\log_2 0.5 = -\log_2 \frac{1}{2} = 1 \text{ bit}$$

$$-\log_2 P(B) = -\log_2 0.25 = -\log_2 \frac{1}{4} = 2 \text{ bits}$$

$$-\log_2 P(C) = -\log_2 0.125 = -\log_2 \frac{1}{8} = 3 \text{ bits}$$

$$-\log_2 P(D) = -\log_2 0.125 = -\log_2 \frac{1}{8} = 3 \text{ bits}$$

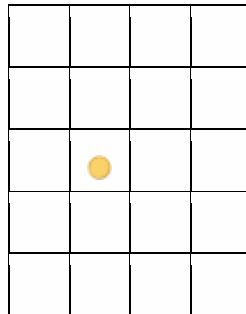
$$(0.5 * 1 \text{ bit}) + (0.25 * 2 \text{ bits}) + (0.125 * 3 \text{ bits}) + (0.125 * 3 \text{ bits}) = 1.75 \text{ bits}$$

This leads to the following entropy:

A similar argument to use the logarithmic function is contained in the following example where we have to find the least amount of binary questions to find a randomly placed coin in

a rectangle with N boxes. Per question we have to maximise information. The probability is assumed to be equal.

Table 6: A randomly placed coin in $N (=16)$ rectangles



$\log_2 16 = 4$. So we need 4 questions to be sure to find the coin. The required information is in the game. We only have 16 possibilities with equal probabilities! We can mathematically prove what is the right strategy. But a similar undertaking in reality is often not always possible. The knowledge is not present as in a closed world that makes the validity of the model cumbersome. Reality is not artificially finite, there are much more alternatives. The logarithmic function assumes probability. Events are based on a priori definition of

$$p(X) = \lim_{N(\text{total}) \rightarrow \infty} \frac{n(X)}{N(\text{total})}$$

probabilities, relative frequencies, there is no experiment to derive these probabilities.

However, we cannot perform infinite trials and there is no guarantee, no proof that such a limit exists. How do we estimate the probability of an event? The only answer we can give is that we believe it in our common sense. Events need to be defined and depending the

definition one is able to identify them. So, is it a mathematical or conceptual operation that we need to conduct in reality?

The data set. Entropy is applied to measure the degree of difference of objects. The objects are described on the basis of observable similarity. But is observable similarity a solid and valid basis?

Table 7: Observable similarity and entropy

Table 8: Functional similarities configuration 2

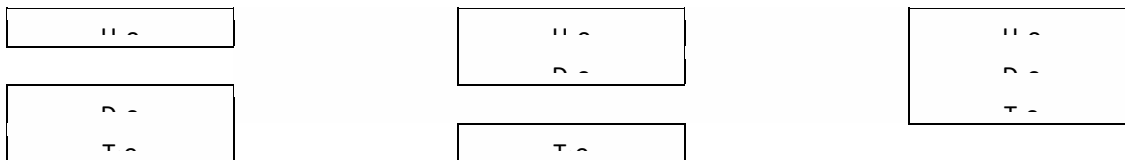
Left: ice cube to float **middle:** dangerous to drink **right:** sulphuric acid

Mathematical learning techniques are mostly suitable for binary categories and less effective for variables with 3 or more categories. If besides H₂O also D₂O and T₂O need to be distinguished, the target variable has more than 4 categories.

In the functional view the classification of an object depends on its use in reality. They are similar if they possess properties that enable them to perform the same function. To create an ice cube that would sink in water D₂O and T₂O are similar molecules, but different from H₂O. Drinking water to stay healthy D₂O and H₂O are similar molecules, but different from T₂O. And if we want to create sulphuric acid the isotopes of water all are similar. Different functions

configurations response variable					entropy
1	H ₂ O	H ₂ O	S ₃ O	S ₃ O	1
2	H₂O	H₂O	H₂O	S₃O	0,811
3	H ₂ O	H ₂ O	H ₂ O	H ₂ O	0
4	H ₂ O	S ₃ O	S ₃ O	S ₃ O	0,811
5	S ₃ O	S ₃ O	S ₃ O	S ₃ O	0
	a	b	c	d	

require different categorisations of the object that is in daily communication generally called 'water molecules'. Objects can be functionally similar even if they possess quite different



observable attributes.

Steps in decision tree induction:

1. Compute base entropy through the target variable: base entropy (see above)
2. Select variable with the highest information gain
3. Select alternative with highest information

4. Recursively repeat
5. Branch entropy 0 is leaf node otherwise split

$$Gini(X) = 1 - \sum_{i=1}^{n} p(i|t)^2 \text{ where } n = \text{number of classes}$$

It is useful to look at the dataset in Table 9.

Table 9: Dataset with 4 observations

The selection of an attribute using entropy leads to X_2 as the attribute with lowest entropy information and thus the highest information gain ending up in the following tree:

Figure1: Decision tree induced using leaves after the root node split

	B	A	B
Entropy	0.5	0	1
Information gain	0.5	1	

As the values of X_2 do not occur multiple times with different values of the response variable. There is a one-to-one correspondence, the average and weighted entropy is 0. If we set aside that there is no exponent that gives 0 to whatever base number, \log_0 is undefined, this problem of overfitting of entropy and information gain is claimed to be due to attributes with a larger number of values. It leads to selecting attributes that are non-optimal for predictive analytics. An attribute that serves as a unique identifier is an illustration of an extreme case. There is no splitting. We can switch to the Gini formula with a splitting strategy that has the same purpose as entropy with a slightly different scale, it looks as follows:

The move to another formula does not help. Splitting the values in realistic categories remains problematic and any mistake leads to a model with a structural lower performance. What we need here is a data set where we use the infinitesimal but where to? There is no target value!

In addition we see in reality the phenomenon of *conceptual interaction*: categorisations are not static, but relative and flexible and change while interacting with other categorisations under the influence of varying functions. The data set is compatible with the following model that displays conceptual interaction between X_1 and X_2 .

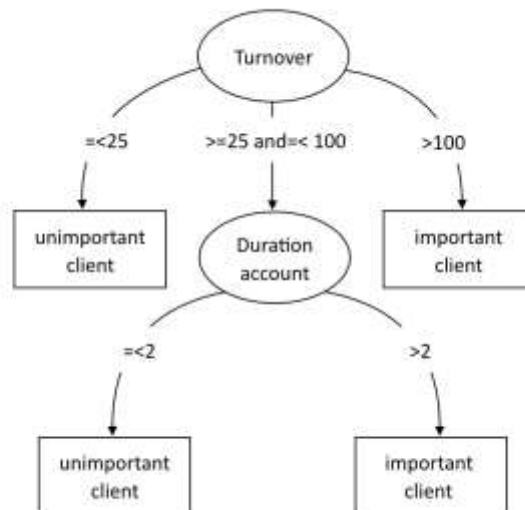
1. $X_1 \leq 2, X_2 \leq 100 \Rightarrow B$
2. $X_1 \leq 2, X_2 > 100 \Rightarrow A$
3. $X_1 > 2, X_2 \leq 25 \Rightarrow B$

4. $X_1 > 2, X_2 > 25 \supset A$

or even more sparse:

1. $X_2 \leq 25 \supset B$
2. $X_2 > 25 \text{ and } X_2 \leq 100 \text{ AND } X_1 \leq 2 \supset B$
3. $X_2 > 25 \text{ and } X_2 \leq 100 \text{ AND } X_1 > 2 \supset A$
4. $X_2 > 100 \supset A$

After the interpretations $X_2 = \text{'Turnover'}$ and $X_1 = \text{'Duration account'}$ and $A = \text{'important client'}$



and $B = \text{'unimportant client'}$ the decision tree is:

Figure 2: Tree based on rational deduction

Entropy and information gain do not assume linear or any relationship between variables and are supposed to be applicable to any set of data. The issues that arise as a consequence of this conception are related to variables that are missing in the data set or present in the data set but finally omitted in the induced tree due like X_1 and a consequence of conceptual interactions that are intractable from a data set.

Entropy and information are closely related. As particles move because of temperature differences and get different characteristics as location, velocity and so on, so that there are infinite states and probabilities in reality, that we do not know. It is maximal missing information characteristic of reality that we we cannot know completely. It is seemingly endless unfolding reality. This constitutes one of the reason that machine learning requires a non-trivial effort in many cases where reality is not a closed world with known data and rules of the game and where human flexibility can shine.

A simplified view on the world leads to the necessity of mathematical and methodological workarounds as various entropies, classifiers and different model selectors. In machine learning the assumption of fixed categorisations is also evident in the algebraic model that is being trained. Naturally related is the assumption that the algebraic model is considered true

for the entire population. In a functional reconstruction relevance of variables originates from the goal and not from a priori observable attributes as in taxonomic approaches of the current information processing paradigm where the sheer weight of examples is considered more essential than any kind of proof.

2.3. On the third assumption: singular conditionals have a universal status

Singular conditional statements may look very attractive, are seen to help solve complex situations, but at the same time can be very misleading when we have to model reality in order to automate. Take for instance, 'If it rains the paths get wet'. This universal quantifier may sound valid, but if it rains in location x and the paths are located at y where it does not rain, the paths will not get wet. At least not because of the rain. Or if it rains and the paths where it rains are having a roof, they will not get wet either. Or when it rains for a split second and the value of the temperature is such that the rain evaporates before hitting the paths. Or when it rains at exactly 2 pm and the paths are where it starts to rain, but there is a strong wind that gives each rain drop a sharp angle so that the paths lying in a perpendicular line are being missed.

'If you aren't on the top by 2:00, it's time to turn around'. This quantifier ignores the endless relativities of reality. I am not at the top, so I have to turn around? Most of the time and at almost any location in the world this conditional does not work. The context with all its implications is not always clear as it is not specified. It best functions if humans know exactly what it means, the computer will not.

2.4 On the fourth assumption: generalisations can be induced

The construction of a model or law -a constant conjunction of phenomena- can be induced on the basis of a limited of data. It can also be designed on the basis of deduction and logical modelling. There are different contexts in which induction can take place: that of discovery, the model is then an empirical generalisation, and that of confirmation.

In data processing communities the conception dominates that available data contains information of reality that can be processed into meaningful classifications. Deep learning researchers and data scientists are in the same playing field. Available variables and their values do not constitute a problem. It is true that there are some data improvements in place, but there is no *essential* discussion on the meaning of the data. There is no focus on a theory behind the facts. They are considered as non problematic theoretical facts. Data problems are solved through methodological tricks or on a technical level, but not epistemological and conceptual.

3. Functional thinking

AI and DBT are in the same methodological spectrum of information processing. Prototypical and probabilistic approaches as in Brown & Link (2017) have deep implications for the adequacy of the models. The conflict between assumptions of this models and reality require a revision of the way we should address modelling. In the functional paradigm models have a different status. Contrary to the information processing paradigm, models are not considered invariant across different elements of interactions of reality. Similarity is based on functional equivalence and not on observable similarities. Given reconstructed goals categorisations are not a priori known and fixed, but are constructed and dynamic. The introduction of other

dimensions leads to a possible adaptation of the categorisations to make the model a reliable representation of reality. Any attempt to relate inductively fixed 'natural' categories will not lead to adequate models. As functional equivalence never assumes 'obvious' similarities, it cannot be assessed by inductive analysis. Human knowledge plays an important role in the reconstruction of causal insights. What is functionally similar is and what is not is for the greater part deductively and therefore logically inferred from a reconstructed goal and from the set of contingent conditions. Information processing cannot play an important role in goal-oriented modelling. Goals can always be achieved by functionally equivalent strategies that can differ widely in terms of natural categories. Statistical laws will not help, because the nature of reality is primary conceptual and secondary statistical. Functional equivalence is not dealt with in data processing. In Information processing there is an agreement on ranking on some kind of utility scale and similarity is empirical. This is demonstrated by the way the modelling proceeds. First the attributes assumed to influence the score are categorised. Then the empirical observations are employed to determine the weights and their distributions and some combination rule to integrate the dimensions into an overall utility (Section 2.2). The dynamic, conditional and flexible way of modelling is lacking. Goal orientation and functional similarity implies that empirical observations may not have natural common attributes. Comparability presupposes the presence of universally valid dimensions. In many cases there is no question of universal choice dimensions. Data processing and logical modelling go through different steps:

Data processing

1. defining utility
2. selection of dimensions
3. integration of dimensions
4. modeling

Logical Modelling

1. goal- and subgoal reconstruction
2. specification of functional equivalent strategies
3. identification of functionally equivalent objects
4. optimisation

Does re-constructive modelling offer an alternative to data processing or is it just a valuable extension? If the main objective of the engineer is prediction on the aggregate level without explanations, then data processing can be quite satisfactory and re-constructive modelling is a valuable extension. If the engineer wants to model the real world and to be able to successfully intervene in it, explanatory capabilities are essential. Three mechanisms are responsible for functional equivalence. In the first place, the mechanism by which under certain conditions other attributes (descriptors) may become important for determining class membership. It is about conditionality or relativity. In physics, the relativity of simultaneity is the concept that distant simultaneity – whether two spatially separated events occur at the same time – is not absolute, but depends on the observer's reference frame (Einstein, 1905). The assessment whether two events occur at the same time, are simultaneous, and belong to the extension to the object-type 'simultaneous events', is conditional. Even the passage of time is conditional upon the reference frame, say the speed of an observer. The Lorentz transformation describes the differences in time under different conditions: t = time in a fixed

frame, t' is time in a moving frame (the other observer), v = velocity, x = distance and c is the

$$t' = \frac{t - vx/c^2}{\sqrt{1 - v^2/c^2}}$$

speed of light.

In many cases, the estimate of probabilities in time and space is not very reliable by not knowing initial conditions (Labini, 2016). Omitting conditions needed for a goal leads to invalid knowledge and exceptions. In the transformation function the segmenting of clients, for example, can suffer from lacking conditions through which clients are considered similar when they are not from the perspective of a goal. The second mechanism is conceptual interaction that cannot be expressed in weights. (section 2.2). The third mechanism refers to the situation where objects may have different attribute values, but where this variation is limited to, or falls within, a goal-constructed category.

4. Beyond Artificial Intelligence and Data Bases

In spite of reality defying adequate modelling and symmetry, we strive to model realistic knowledge and data that can be embodied into the mechanics of a computer system. But enterprise systems dominate with massive bodies of difficult-to-modify code. A previous wave of service-oriented architectures did not increase flexibility and this situation did not change much either with the advent of AI and big data. The flexibility of children learning and responding to quantifiers as described in Crain (2017) is unreachable for machine learning. Deep learning is not capable of integrating prior knowledge as mentioned by Marcus with respect to the physics of falling towers in Lerer et al. (2016): 'Newton's laws, for example, are not explicitly encoded; the system instead (to some limited degree) approximates them by learning contingencies from raw, pixel level data (Marcus 2018). In deep learning, ongoing massive maintenance costs due to data dependencies, fuzzy boundaries and code entanglement and the change anything, change everything phenomenon impact application development. 'ML [Machine Learning] systems have a special capacity for incurring technical debt, because they have all of the maintenance problems of traditional code plus an additional set of ML-specific issues' (Sculley et. al. 2015).

Functional thinking can re-adjust the focus to conceiving reality independent of mathematical, statistical and other knowledge and data representation formalisms. It delivers paradigmatic benefits:

- a. *Qualitative amendment of data.* by re-conceptualising facts of the information processing paradigm and clarifying that facts only come into existence through an object-type that is goal dependent. For example, the instantiation of an object as H₂O or T₂O,, provides re-interpretations of observable data of a training set;
- b. *Practical successes.* by generating new facts through the concept of multiple object-types in case where multiple goals are involved. A person can be intelligent or not at the same time and event A can precede B in time and vice versa both being consistent with reality;
- c. *Quantitative amendment of data.* by exposing wrong facts that, for instance, are extensionally asserted in database fields with a lacking intension. The functional perspectives makes clear that Intensions need for non-compensatory variables the

alternative of an infinitesimal i.e. flexible modelling by enabling endless conditionality to reflect unfolding reality;

- d. *Theoretical successes.* by revealing hidden assumptions and predicting the validity of models through its analysis of the nature of knowledge. Typifying formalisation potentials helps to see *in advance* whether machine learning can deliver as in cases of Go (Silver et al. 2017). The rationality principle clarifies the problems and work arounds that occur when using regression analysis or entropy for machine learning and gives a priori insight in the consequences of missing variables and conceptual interaction.

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The Effect of Customer Knowledge Management on Organizational Performance

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Abstract: Nowadays, the development of knowledge management (KM) does play an important role in the concept of Customer Knowledge Management (CKM). This development shows the rapid change in all areas of life, due to the effects of globalization and the development of highly acclaimed KM. On the other hand, CKM is considered important, because its implementation benefits the field of operations and services, that can improve personal competence, maintain availability knowledge, innovation and product development. Therefore, scholars regard CKM as a strategic resource for businesses to improve innovation, facilitate the detection of new market opportunities, and support long-term customer relationship management (CRM). However, literature suffers from a lack of understanding of customer knowledge's role in improving the performance of organization. Thus, the purpose of the study is to investigate the impact of CKM on organizational performance (OP). This study uses a questionnaire and statistical analytical techniques (Structural Sequential Equation Model) to explore the effect of CKM on OP. The statistical population of this research includes 500 insurance companies in Malaysia. The sample size was estimated 258 people by using Krejcie & Morgan Table (1970) and stratified sampling method was used. Data collection tool is close ended questionnaire with Likert's five-option scale. Therefore, 516 questionnaires were distributed and 180 returned questionnaires were analyzed. Measurement model was analyzed to determine data validity and the hypotheses were tested using structural model. The findings showed that that CKM dimensions namely; Knowledge for customers (KfC), and Knowledge from Customers (KfrC) had a positive impact on the performance of organization and provides competitive advantages. However, knowledge about customers (KaC), indicated insignificant impact with OP. This study provides clear implications related to the theory and contributions to the literature related to CKM as well as in insurance industry. The study also provides invaluable insightfulness to various stakeholders including policy makers, institutional support and insurance agent about the importance of knowledge about customers (KaC), Knowledge for customers (KfC), and Knowledge from Customers (KfrC) in

determining the performance of insurance industry. Hence, organizations should acquire valuable customer knowledge in order to enhance the relationship with customers, as well as enhance their performance.

Keywords: Knowledge, Knowledge Management, Customer Knowledge Management, Organizational Performance

1 Introduction

The business world is currently challenged to be able to survive in a business environment which is constantly changing. These challenges require organizations to improve competitiveness in domestic and international markets. In order to be able to survive in the business environment, the organization performs a variety of ways such as product innovation, expanding markets, improving service quality, improving the production process, improving the organization system, and making cost savings. Knowledge is inherent in the organization and in each organization member. Thus, organizations need to view knowledge as a valuable and strategic source in order to remain competitive.

Knowledge management (KM) is an interesting issue since its appearance. Various academics and business practitioners began to develop KM through research and application in business practices. Becerra-Fernandez and Sabherwal (2001) interpret knowledge as a result of one's reflection and experience, so that knowledge is always owned by individuals or groups. There are two critical dimensions that need to understand knowledge in an organizational context, that is, first, knowledge exists in each individual, group or organization; second, knowledge can be seen as something that can be saved, and as a process that is the process of knowing something. Based on two dimensions, knowledge can be divided into tacit and explicit knowledge. Tacit knowledge is knowledge gained from experience, activities done, and hard to define where it is usually shared through discussion, stories. According to Nonaka and Takeuchi (1995), tacit knowledge is interpreted as a knowledge that is personal, specific, and generally difficult to formalize and communicated to other parties. In organizations the process of disseminating / sharing knowledge will help achieve organization goals. Explicit or codified knowledge is defined as knowledge can be transformed in a formal form and systematic language (Nonaka & Takeuchi, 1995). According to them, explicit knowledge is knowledge that has been formulated, usually presented in written form such as regulations, books and literature. The biggest challenge faced by organizations is converting tacit knowledge leads to explicit knowledge, or vice versa. Organizations are required to able to translate knowledge that exists in individuals, groups or teams, and organization becomes evident in the form of products and services produced.

2 Literature Review

2.1 Customer Knowledge Management (CKM)

Nowadays, the development of KM does play an important role in the concept of CKM. This development shows the rapid change in all areas of life, due to the effects of globalization and the development of highly acclaimed KM. As a result, the role of science has become more prominent, because only with knowledge, changes that occur can be addressed appropriately. The evidence indicates that is a potentially powerful competitive tool, contributing to improve

both companies and their customers. It is a continuous strategic process by which companies enable their customers to move from passive information sources and recipients of products and service to empowered knowledge partners (Gassmann & Keupp, 2012). It incorporates principles of KM and customer relationship management (CRM), but moves decisively beyond it to a higher level of mutual value creation and performance (Gibbert, Leibold & Probst, 2002). CKM refers to tools that enable framing strategies that help companies derive valuable insights about customers, not from the information gained from knowledge repositories that lie within the organization but from the customers' thoughts and deeds. Customer knowledge, to be precise, is the *"collection of information and viewpoints that an organization has about its customers"*. According to this definition, the role of CKM is to capture and organize customer data to allow it to be shared and discussed across the functional areas of the organization that both directly and indirectly 'touch' customers. But the most critical issue is not managing the information as it is available to an organization at one point of time, the issue in today's competitive world is to understand and predict the future behavior of the customers, which Customer relationship management (CRM) might not be successful in doing. Customer knowledge is not a new concept to many companies. Companies do possess customer knowledge in the form of data within the marketing, sales or customer care processes. But in most cases this is in a fragmented form and therefore there are lot of difficulties in sharing and analyzing this data, which in most cases end up being incomplete. CKM aims at procuring customer data from the past, not just from those who have a direct relationship with customers, but also from those who have an indirect relationship with them. Thus, the information required for CKM stretches through the entire value chain and attempts to procure restore and manage the mission critical information, which could be put to future use. Hence CKM demands systems and processes to gather fundamental information pertaining customers like who they are, what they think and what they do, thus an alignment of KM practices and CRM processes to attain business efficiency. CKM can be called as a strategic process by which companies allow their customers to become strategic partners in their initiative to understand them (customers) better. This is because CKM is not a "one size fits all" approach.

According to Wilde (2011), CKM implementation is expected to fill knowledge gap to the customer. If knowledge is used in the target orientation, this can be needed to be able to be accessed and to share it systematic. By integrating CKM, customers can become active partners for company. The goal is to improve customer orientation and to build relationships customer in the long run. Therefore, transfers between companies and customers are very necessary by implementing CKM. Customers are more integrated than CKM and become partners active knowledge, as a result of knowledge from, to and about customers can used efficiently.

Therefore, CKM can be seen as a systematic process for managing individual's three dimensions of customer knowledge namely; Knowledge about customers (KaC), which can include knowledge of potential customers and customer segments as well as knowledge of individual customers (Ahmad Suffian, 2014). Knowledge about customers is an accumulation to understand the customer's motivation and their address in a personal way. Next is Knowledge for customers (KfC), which can include knowledge for customers about products, markets and suppliers (Ahmad Suffian, 2014).. The third dimensions is Knowledge from customers (KfrC), which include knowledge from customers about their ideas, thoughts, specific product preferences, creativity, or experience of knowledge (Ahmad Suffian, 2014).. The emergence of customer knowledge can be used by organizations or companies to identify,

create, clarify, and distribute knowledge for reuse, discovery, and be learned within the organization.

This study adopted Knowledge-Based View (KBV) as a theory underpin. This is because the importance of the existing knowledge has been given much attention with the introduction of knowledge-based view (KBV) theory. KBV, which comes from the concept of resource-based view focuses on the value of intangible assets and suggests knowledge as critical to a firm's long term success. Therefore, with the implementation of KBV, managers can enhance a firm's capacity to produce and efficiently update knowledge. This study also uses Venkatraman and Ramanujam (1986), theory of organization performance (OP) because there are subjective measurements that can lead to objective measurement. It is a measurement using two dimensions (i.e., non-financial and financial performance). Scholars regard CKM as a strategic resource for businesses to improve innovation, facilitate the detection of new market opportunities, and support long-term customer relationship management. However, literature suffers from a lack of understanding of customer knowledge's role in improving the performance of organization.

2.2 Organizational Performances (OP)

Steer (1975) in his study has identified and reviewed 17 models of organizational effectiveness and integrated the contents concerning the measurement of OP. After reviewing ten different types of measurement, he generalized OP into three dimensions namely; financial performance, business performance and organization effectiveness. It was further supported by Kabiru, Mohd Rizal and Norlena (2012) who claim that OP is assessed by the application of financial and non-financial measurement. According to Venkatraman and Ramanujam (1986), financial performance centers on outcome-based indicators assumed to reflect economic goals, inclusive of accounting-based and market-based metrics. Financial performance includes return on investment, return on sales, return on assets and sales growth. Operational performance refers to non-financial dimensions and focuses on operational success factors that might lead to financial performance (Venkatraman & Ramanujam, 1986). Operational performance includes both product–market outcomes (including market share, efficiency, new product introduction, innovation and product/service quality (Venkatraman & Ramanujam, 1986). Measurement of overall effectiveness reflects a wider conceptualization of performance and includes reputation, survival, perceived overall performance, achievement of goals and perceived overall performance relative to competitors (Lewin & Minton, 1986; Venkatraman & Ramanujam, 1986). Meanwhile, Hanvanich, Sivakumar and Hult (2006) measure OP as a combination of overall performance and innovativeness.

According to Shahzad, Luqman, Khan and Shabbir (2012) and Chenhall (2005), the use of financial and non-financial indicators is generally the most appropriate measurement for the organization in which it is also helpful to enhance protection towards uncontrollable events outside the organizations. Thus, many studies have selected a combination of operational measurement (e.g: non-financial) and financial measures to reflect overall OP (Rhodes, Hung, Lok, Lien & Wu, 2008). Academicians and practitioners give various measurements for financial and non-financial performance in their research to measure OP. Zack, McKeen and Singh, (2009) identified product and service innovation, quality, customer satisfaction, retention and operating to measure OP. In addition, Huang, Hsu and Chiau (2011) used efficiency growth, profitability and organizational innovation to identify OP. The findings of previous studies suggested that mixed measurements have been used by scholars and

practitioners in examining OP. However, a large body of previous studies focused on financial and non-financial indicators as measurement of OP which provides a basis for the present study.

2.3 CKM (Knowledge from customers)

The concept of CKM as proposed, first by Gibbert et al. (2002) suggested that market opportunities are influenced by knowledge residing in customers. Thus, knowledge from customers is presumed to be a better predictor of CKM. The idea suggested by Gibbert et al. (2002) was supported by Gebert, Gelb, Kolbe and Brenner (2002) who pointed out that the knowledge gained from the interaction with customers can be used to improve customer service and foster the development of new products.

In relation to OP, new product development is one of the dimensions in OP. Gibbert et al. (2002) in investigating Old Mutual, the largest insurance companies in South Africa suggested that knowledge from patients is important for a company. Their study found that customer knowledge is being used by Old Mutual Company to develop new medical insurance products. The development of the new product by Old Mutual Company is based on knowledge and demand from the customers. Their study on more than two dozen companies over the last six years in pharmaceutical and insurance industry revealed that by managing knowledge from customers, organizations are more likely to accurately perceive market opportunities.

A study by Salomann, Dous, Kolbe, and Brenner, (2005) provides further support for the claim that knowledge from customers can improve OP. Salomann et al. (2005) have conducted an in depth case study on CKM dimensions at Siemens and Electronic companies and found that knowledge from customers has led to the product development and innovation which were described as the performance outcome of the company. As a result, he found that CKM has positive effects on OP. To clarify the relationship technically, this study highlights on the following hypothesis:

Hypothesis 1: Knowledge from customers positively influences organizational performance.

2.4 CKM (Knowledge for customers)

Knowledge for customers is transmitted from one direction to support the organization, customers and to make customers better understand the products that the organization offers (Gebert et al., 2002; Smith & McKeen, 2005). This knowledge flow can help organizations to retain their customers by focusing on customer preferences that are constantly changing and improving the products offered that may eventually lead to the purchase of products by customers (Feng & Tian, 2005). As a result, it helps organizations to retain the current customers and subsequently improve their profits.

Zanjani, Sakhaee, and Shahbaznezhad, (2008) in investigating CKM dimensions of 10 companies in Britain found that knowledge for customers has the highest utilization with 42% as compared to 32% and 26% for knowledge about customers and knowledge from customers respectively. These findings were supported by Smith and McKeen (2005) who found that in order to enhance OP, companies such as Google, e-Bay and Amazon are putting more emphasis on knowledge for customers to make their products and services more intuitive and user friendly. However, Zanjani et al. (2008) stated that there are fewer studies that

emphasized on knowledge for customers that can lead to the improvement of OP. To assess the relationship, the following hypothesis is derived:

Hypothesis 2: Knowledge for customers positively influences organizational performance.

2.5 CKM (Knowledge about customers)

Knowledge about customers is a firm's understanding on the background of clients, needs and preferences for product features (Chen & Su, 2006; Feng & Tian, 2005; Gibbert, et al., 2002). Customers interact with organizations through a variety of channels such as email and Facebook. Based on the type of channels they interact, organizations can segment their customers and also determine their relationship with them. The use of customer database is very important to keep and update all knowledge about customers. Moreover, this can be done through knowledge derived from the statistical information concerning customers' interaction with the company.

This statement is further strengthened by Gebert et al. (2002), who found that knowledge about customers, markets and other factors can be regarded as opportunities to enable faster and more flexible reactions to threats. Research by Bueren, Schierholz, Kolbe, and Brenner, (2004) pointed out that if organizations have systems and good database, knowledge about customers can improve the service levels of the organizations and increase OP. From the findings, they emphasized that knowledge about customers is more important as compared to knowledge for customers and knowledge from customers. According to them, without knowledge about customers, an organization could suffer competency shortages with a negative impact on OP.

Smith and McKeen (2005) in their study found that with the use of a customer service workbench, a technology based solution in the organization, it has created customer knowledge database about customers. The company was able to increase 100% its customer base and 50% increase in its sales force. Hence, it is assumed that *Knowledge about customers* influences OP as proposed in the hypothesis below:

Hypothesis 3: Knowledge about customers positively influences organizational performance.

3 Research Methodology

This study utilized survey research. The questionnaires were used to collect data. A corresponding 5 Likert scale was deployed (1 for “Strongly Disagree”; 2 for “Disagree”; 3 for for Neither Agree “Neither Agree nor Disagree”; 4 for “Agree” and 5 for “Strongly Agree”). Prior to pilot testing and main data collection, the questionnaires were pre-tested with several experts in the field and also several insurance companies who could become the prospective respondents. The questionnaires were pilot tested with 81 insurance companies. Using the SmartPLS, the responses of these 30 companies were analyzed for assessing the reliability of the measurements. The recorded Cronbach Alpha for all variables employing multi-items estimated range from 0.65 – 0.88 which suggests that the questionnaires were reliable (Kline, 2011). The populations of the study were 500 Malaysian insurance companies listed in the Bank Negara database. There were 182 companies responded. However, only 180 questionnaires were valid for the data analysis. The remaining 180 were analyzed using Partial Least Square (SmartPLS version 3). This study will first develop and assess the measurement model and followed by the development and assessment of the structural model. Previous studies have indicated a sample threshold of as little as 100 samples for PLS-SEM (Reinartz, Haenlein, and Henseler 2009). Alternatively, one can revert to the more restrictive minimum sample size recommended based on statistical power (Hair, Hult, Ringle & Sarstedt, 2014). We used G*Power to calculate the sample size based on statistical power (Faul, Erdfelder, Buchner and Lang. 2009), suggesting that we needed a sample size of 129 for a statistical power of 0.95 for model testing. Since, our sample size exceeded 129, the power value in this study also exceeded 0.95. Moreover, the minimum power required in social and behavioural science research is typically 0.8. Therefore, in both cases, we can conclude that our sample size was acceptable for the purposes of this study.

The respondents of the study were 180 Malaysian insurance companies, the categories of company consisted of 45 life insurance (25 %), 92 general insurance (51.11%), 33 life takaful (18.33%), 9 general takaful (5%) and 1 others (0.56%). In terms of company size, the majority of respondents have employees less than 25 (88 companies, 48.89%), 26-25 employees (15 companies, 8.33%), 51-75 employees (6 companies, 3.33%), 76-100 (13 companies, 7.22%) and more than 100 (58 companies, 32.23%). With regards to company’s annual revenue, 145 insurance companies had annual revenue more than USD 12.23 million, 16 companies earned revenue of USD 5 – 10 million and 19 companies whose revenues were less than USD 5 million.

3.1 Population and Sample Size

The population of this study consists of Malaysian insurance companies listed and registered with Bank Negara Malaysia. The type and category of insurance can be divided into Life and General Business Insurance, Life Business Only Insurance, General Business Only Insurance, Takaful Operators Insurance and International Takaful Operator Insurance. Then, all listed insurance companies involving 500 companies serve as the population of the study. At this point, the sample selection was based on the stratified sampling method, using type and category of insurance as the basis for stratification.

Krejcie and Morgan (1970) suggested a table for determining sample size for a given population for reference. Based on Krejcie and Morgan’s (1970) table for determining sample size, for a given population of 787, a sample size of 258 would be needed to represent the population. There are several reasons to justify the selection of insurance companies as the

population for the study. First, there has been a growing interest worldwide in the efficiency literature about the insurance industry (Rai, 1996; Fukuyama, 1997). Second, Norma and Nur Edzalina (2011) emphasized that while there have been numerous international studies on the performance of other financial service industries, only a few are related to the insurance industry. Third, a study on the performance of the insurance industry is crucial since the said industry is currently facing many challenges, including increased competition, consolidation, solvency risks, and a changing regulatory environment (Norma & Nur Edzlina, 2011). Fourth, there are a few researches, as to date, on CKM and OP especially in the insurance industry (Salamonn et al., 2005). Thus, they suggested that researchers must establish further evidence on the relationship between CKM dimensions and OP especially in the insurance industry. The stratified sampling design is a commonly used probability method that is superior to the simple random sampling design as suggested by Noorzan (2010). This is because each of the important segments of the population is represented and is more valuable and differentiated information can be obtained with respect to each group (Sekaran & Bougie, 2010) and sampling error will be reduced (Noorzan, 2010). In ensuring better responses and minimizing the responses' risk, the researcher decided to send 300 sets of questionnaires as better results can be derived from a large sample and the results can be generalized (Hair, Black, Babin & Anderson, 2010).

3.2 Operationalization and Measurement of Variables

The independent variable for this study is CKM, while the dependent variable is OP. These variables were all measured using item scales developed by previous scholars drawn from existing literature. Some modifications were made where necessary to suit the study context. Traditionally, there are three knowledge flows; namely, knowledge for customers, knowledge about customers and knowledge from customers (Gebert et al., 2002, Ahmad Suffian, 2014). These knowledge flows are measured by thirty nine items using five self-rating items on a five point Likert scale, in which thirteen items reflect knowledge for customers, thirteen items measure knowledge about customers and another thirteen items gauge knowledge from customers. These questions items were adapted from Belkahla and Triki (2011). The next component is the dependent variable, namely, OP. This study adopted Venkatraman and Ramanujam's (1986) model based on several justifications. First, there is a unified combination of measurement for performance that consists of financial and non-financial items. For the purpose of this study, OP consists of perceptions of financial outcomes such as sales growth, company return on investment (ROI), company return on assets (ROA), and perceptions of non-financial measurement such as market share, new product introduction and product quality.

4 Data Analysis and Findings

Quantitative data were recorded, checked, and cleaned using AMOS software version 21™ to yield composite scores of each scale and were used for statistical analysis. As this study used face-to-face administered questionnaire, hardly any missing value was observed at all. Descriptive analyses were run using SPSS, while the hypotheses were tested using Structural Equation Modeling (SEM) with the aid of AMOS software version 21™.

4.1 Assessment of Measurement Model

To examine the research model Partial Least Square (PLS) analysis technique was employed by using the SmartPLS 3 software version 3.2.8 (Ringle, Wende & Becker, 2015). In an effort to refine all structural equation models two stage analytical procedure was employed, where researchers tested the measurement model and structural model recommended by Hair, Sarstedt, Hopkins & Kuppelwieser (2014). Prior to structural modelling, the study has to assess the measurement model of latent construct for their dimensionality, validity, and reliability. Cronbach's (α) and composite reliability were also tested as recommended by Henseler, Ringle & Sarstedt (2015).

The measurement model used in this study included five constructs: knowledge for customer (KfC), knowledge about customer (KaC), knowledge from customer (KfrC), and organizational performance (OP). In assessing a model's reliability, the loading of each indicator on its associated latent variable must be calculated and compared to a threshold. Generally, the loading should be higher than 0.7 for indicator reliability to be considered acceptable (Hair, Ringle, and Sarstedt, 2014). Table 1 indicates that most of the indicator loadings on their corresponding latent variables for the respondents were higher than 0.7.

4.2 Validity Assessment

Validity was assessed in terms of convergent validity and discriminant validity. Convergent validity is the extent to which the scale correlates positively with other measures of the same constructs (Malhotra, 2002). Convergent validity of measurement model is usually ascertained by examining the factor loading, average variance extracted (AVE) and composite reliability (CR) (Hair, Black, Babin, Anderson & Tatham, 2010). All the values were above 0.6, shows the convergent validity of the model. Convergent validity can be evaluated by examining the loading (≥ 0.6), $AVE \geq 0.5$, and $CR \geq 0.7$ (Kim, 2010). Each item's coefficients on its underlying construct were observed. A test of each item's coefficient was used to assess convergent validity. All values fulfill the required standard, indicating high convergence validity. Table 1 shows the results of factor loadings threshold level of 0.7 as recommended by Hair et al. (2010).

Table 1: Factor loading, composite reliability (CR) and average variance extracted (AVE)

Variables	Loading	C.R.	AVE
KaC	0.811	0.875	0.636
KfC	0.808	0.871	0.629
KfrC	0.890	0.914	0.603
OP	0.807	0.864	0.561

Besides assessing the convergent validity, the study also evaluated the discriminant validity. Discriminant validity can be evaluated by examining Fornell-Larcker Criterion (Fornell &

Larcker, 1981). Fornell and Larcker (1981) have suggested examining whether the square root of the AVE for each construct is greater than the correlation between the constructs. Tables 2 shows the results of the discriminant validity assessment of the measurement model using the Fornell–Larcker criterion indicate that the models possess acceptable discriminant validity.

Table 2: Discriminant validity (Fornell and Larcker)

Constructs	KaC	KfC	KfrC	OP
KaC	0.798			
KfC	0.781	0.793		
KfrC	0.667	0.705	0.777	
OP	0.624	0.703	0.607	0.749

4.3 Assessment of Structural Model

We performed bootstrapping involved 500 samples whilst our actual sample stood at 180. The SEM results are presented in Table 3. It can be observed that R^2 values for OP is 0.30, suggesting that 30% of the variance in OP is explained by the knowledge for customer (KfC), knowledge about customer (KaC) and knowledge from customer (KfrC). Table 3 shows that all beta path coefficients were positive and in the expected direction and were statistically significant except the beta path coefficient between knowledge about customer (KaC) in which t value is less than 1.645. To elaborate the significant effect of knowledge for customer (KfC) ($\beta = 0.464, p < 0.05$) and knowledge from customer (KfrC) ($\beta = 0.190, p < 0.05$) were found on OP. Thus H2 and H3 are supported but H1 is not supported. The result reveals that both knowledge for customer (KfC) and knowledge from customer (kfrC) are equally important predictors of organization performance (OP) compared to knowledge about customer (KaC). We evaluated for multicollinearity among the variables in our model, and did not find any cause for concern using the criteria of variance inflation factor (VIF), which were all below the suggested value of 5.00 (Hair et al., 2014).

Table 3 Structural Model (Hypotheses Testing)

Hypotheses	Beta	S.D.	T Values	Decision
KaC -> OP	0.135	0.111	1.222	Not Supported
KfC -> OP	0.464	0.116	4.009	Supported
KfrC -> OP	0.190	0.094	2.013	Supported

Note: significant levels: ** $p < 0.01$, * $p < 0.05$

5 Discussion and Conclusion

The objective of this study is to investigate the impact of CKM on OP. From multiple regression analysis on 180 samples, the empirical evidence shows that CKM dimensions namely; *knowledge for customers and knowledge from customers* has a significant positive effect on the performance of insurance companies. However, the findings show that knowledge about customer did not have significant effect on OP. This finding arguably links well with the Knowledge Based View (KBV) which postulates that when knowledge is effectively managed, it creates unique capabilities which contribute to improved business performance through innovation (Grant, 1996; Leal-Rodríguez et al., 2013). The results indicate that organizational

performance as measured by sales growth, ROI, ROA, market share, product quality and new product development is influenced more by knowledge from customers rather than knowledge for customers and knowledge about customers. These findings are consistent with previous studies that found knowledge from customers about insurance was clearly prominent in CKM dimensions (Gibbert et al., 2002; Garcia-Murillo & Annabi, 2002; Paquette, 2006; Ho, 2009; Rowley, 2002). It is possible to say that knowledge from customers is important to keep the knowledge required and to expand the knowledge residing in customers for customers and corporate benefits. Knowledge from customers can be used to facilitate new product development as well as catering for customers' needs and wants. This implies that insurance companies collect knowledge from their customers, disseminate this knowledge inter-functionally and inter-departmentally and respond to customers' needs based on this knowledge; the process will affect this organization in terms of high organizational performance.

One possible reason to support this finding is the awareness of Malaysian citizens nowadays to buy insurance policies such as life insurance and family insurance. For example, the increasing demand for insurance policies such as conventional and Islamic takaful by Malaysian citizens have caused the insurance companies to market their products and services intensively in order to increase their number of potential customers. The insurance companies have conducted successful campaigns in providing knowledge for customers about their current products.

Moreover, insurance companies have introduced many types of insurance such as family takaful, general takaful, life and general insurance as well as car and home insurance. The introduction of various new insurance products can thus attract new customers and as a result can improve the organization sales growth. It seems that, by using the customer data or profile, insurance companies can make follow-up persuasion in attracting current customers to buy another insurance policy

6 Limitations and Future Research

Notwithstanding the contributions, there are three main limitations identified and these provide opportunities for future research. First, the sample of this study is limited to insurance industry in Malaysia. Future study could consider other types of business involved in Malaysia, in order to unveil better prediction for the dissimilarity in OP. Second, the sample of only the managers in organizations limits the generalization of the results. In future, studies could incorporate the data from other position in organizations to provide richer interpretation and generalization of the findings. Third, this study only considered some internal factors such as knowledge for customers, knowledge from customers and knowledge about customers. Future research could include other factors mainly related to external forces such as economic development, government support, growth potential, business networking, involvement and competition. The inclusion of these factors could enhance the understanding on the contributing factors that affect the performance of organizations.

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The World is Broken, We Need to Fix It: Path to Strategic Harmony

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Abstract: The article is based on the emerging book “Strategic Harmony: Fixing the Broken World” by Ira Kaufman and Velimir Srića to be published in mid 2019. The text deals with the challenging conditions in the world and the ways to address them. The proposed solution is a model of Strategic Harmony, based on many years of research and consulting experience of the authors. The purpose of this text is to help transform our broken world to what it can become instead of accepting the present situation as the default. Most people see what is wrong and just criticize it - we want to engage in a radical change. The article presents key ideas and concepts from the book that targets leaders of businesses and institutions providing tools to realize sustainable impact on the path to change and organizational harmony. The model is a roadmap describing the stages and components of Strategic Harmony as the solution to burning global issues. Strategic Harmony is the required MINDSET for change. It focuses on a new approach to Power, the use of Transformative Love and the application of TEST values (Trust, Empathy, Sustainability and Transparency) in leadership practices when building successful organizational culture.

Keywords: Strategic Harmony; Fixing the Broken World; Digital Leadership; TEST Values: Trust, Empathy, Sustainability, Transparency; Leader as Catalyzer

1 Introduction

Most people see the world as it is and get frustrated. We need people who see the world as it could be and get ready to change it! This well-known brainy quote is the reason why, for the last two years, Ira Kaufman (<http://www.entwinedigital.com/about/ira-kaufman/>) and I have written a book (to be published in mid 2019) with the title of this article. We seem to be very ambitious – our goal is like in the famous English nursery rhyme, to put Humpty Dumpty together again (Kaufman, Srića 2019).

There are many concerns and equally many approaches to the growing global ecological, economic, political and social problems. At the last World Economic Forum 86% of global executives suggested the world is facing a major leadership crisis - with executives having less than 50% confidence and trust in the leadership of business, media, government, education, and religious institutions. Despite all the technological innovation, we are unable to deal with the burning issues of political instability, suspended economic growth, poverty, injustice, international terrorism, global warming, or epidemic depression. It seems that humanity has never faced such deep social and economic problems, and, at the same time, was equipped with such a low level of understanding of the scope and reach of these problems.

What are the solutions? We all recognize the vast potential of collaboration on emerging technologies. Today, almost everything humanity wants to achieve becomes possible. Why are we still pursuing wrong goals, trusting questionable ideas, and following the same deadly routine from the past? The answer lies with the values and beliefs. As Albert Einstein used to point out, *we cannot solve our problems with the same thinking we used when we created them.*

There is a famous story about five monkeys (Srića, 2016). As a start, we hang a bunch of bananas at the cage top and place a ladder nearby. Soon, a monkey climbs the ladder, trying to get some bananas. The moment he touches the ladder, we sprinkle all the animals with ice-cold water and they quickly back off. Soon, another monkey goes for the ladder, just to find out that the ice-cold-water situation is still there. From that moment on, we no longer need the sprinkler. If a monkey even tries to get close to the ladder, other monkeys are sure to knock him flat.

Now, we may remove one monkey from the cage and replace him with a newcomer. Seeing the bananas, he tries to reach for the ladder, only to be molested by all others. We replace another monkey with a new one. If he tries to reach for the ladder, he is severely beaten by all, including the former newcomer. We may repeat the procedure until the initial five are removed from the cage. Regardless of the fact that none of the remaining monkeys has ever been sprinkled with ice-cold water, none of them ever tries to get the bananas because, if he did, he would be stopped by all the others. Why? They have learned the way things are done here. And who are they to question the common practice?

Of course, the story depicts the world and its organizations. It is broken because individuals and institutions are trapped in the monkey cage of old economic, social and political values, based on **the truths that we consider self-evident** (Kaufman, Srića 2019, p.18-19):

Successful business means to maximize profits; greed supersedes generosity.

1. For a leader to be successful, he or she must be on the top of a hierarchy and control information and decisions.
2. We are secure only with people we are familiar with in terms of religion, culture, ethnicity, and gender.
3. Quality of food, health care, access to water, and quality of life are determined by wealth and ability to pay for these benefits, they're not a universal right.
4. Gross Domestic Product (GDP) is the best tool to measure success and compare economies and societies
5. Unethical and even criminal behavior is OK as long as you don't get caught.
6. Our resources are growing and being replenished; there is no need to be restrained.
7. We have done things for many years quite successfully, why should we change.
8. Nobody is unbiased and everyone has an agenda, so don't trust anyone.
9. Support a party or movement based on their tradition instead of how they act on their current principles.
10. Democracy is the best method to deal with public issues.
11. Majority is always right, just follow the masses.
12. Lying is okay; as everyone does it.

13. Strive to win; always be right and in control, compromise is a sign of weakness.
14. Sharing of ideas, collaboration isn't successful; it's better exploiting ideas by yourself.
15. Admitting your wrong or made a mistake or don't have complete knowledge is a sign of weakness and needs to be covered up.
16. Asking forgiveness is a weakness, emphatic people are wimps.
17. Taking a risk and failing is stupid behavior, not a learning experience.
18. You are what you do and what you "possess"; money opens all doors.
19. Sustainability is just focused on our environment.

Behind each of the "truths" there is a belief and a value that underpins a resulting action. As an outcome, we are witnessing the shattered world, democracy, market economy, morality and ethics, culture, health, education, and ecology. Our model is aimed at providing executives and managers in government, business and nonprofits with a breakthrough in thinking about the false "truths" we accept and live by and provide a road map for change.

All the broken things need to be fixed. In order to do it, we must assess the sources of illness, and come up with a remedy. That is why this article is organized in two parts. The first tries to provide a diagnosis. The second discusses the adequate cure.

2 The Broken World Signs

To better understand why our world has become broken let us turn to a story about Nan-in, a Japanese teacher of Zen. One day a university professor from the West, who was eager to learn about this school of Buddhism, paid him a visit. According to the old tradition, Nan-in personally served tea to his guest. However, even after his cup was full, he continued to pour. Unable to watch the tea flowing all over the table and dripping on the floor, the professor decided to interrupt him by saying: The cup is full, you can't pour any more. Just like this teacup, Nan-in answered, you too are full of ideas, views and prejudices. I cannot teach you Zen if you are not ready to empty your cup.

This story points out at the "content" and beliefs with which our institutions and leaders have filled our cups. An open assessment of each institution is critical to see what we have learned, what beliefs we hold as "sacred assumptions" and what we have to unlearn. We have to reevaluate our assumptions, and the beliefs that we cherish in each Institution and see if they are still applicable in the current environment. Are they implemented or just serving as posters on a wall? Are they the foreground or the background of the purpose of our institution?

I offer a quick tour of our Global Cup. What is still there, what should stay there, and what should be spilled out. For the sake of the argument, there are only four important issues:

Devoid of caring, compassion: With the speed of the news cycles and real time reporting, we as a global society have become numb and desensitized to seeing inhumane acts, suffering children, and cold blooded murder. Our bar for acting with our compassionate heart has been lowered to our immediate circle of family and friends. Our circle of caring has shrunk as has our concern for others – in how we speak, act and support others. Compassion lies at the roots of empathy. The politician is elected to serve the needs of his/her constituency. Compassion has been replaced by the politics of getting elected and raising funds. The businessperson

wants to have their business generate prosperity for the community if it doesn't disturb their profit picture. Compassion must reign to rebalance the shattered world.

Everything is on sale: Today the law of supply and demand measures most things; hence, everything is for sale and can be bought. If you have enough money, you can buy position, power, job, love, justice, health, youth, sport result or verdict. Money can get you out of most troubles. Ethics has become a lost standard of behavior. Everything is an object of trade; corruption is the new God. Interest groups concentrated around powerful individuals heavily influence the globalized politics, and we have Putinism in Russia, Trumpism in America, Merkelism in EU, and Xiism in China. We witness huge bribery cases in companies like Siemens, Samsung, British Aerospace, and Alcatel-Lucent. Exposed to such news on a daily basis people are desensitized to ethics. It becomes quite normal that the best entertainer, athlete, or movie star makes a thousand times more money than the best teacher, educator, doctor or scientist, simply because such ratio is an outcome of the free market, in other words, it reflects the supply-demand relationship.

Mass-consumption culture: The culture is shattered and broken. The market of cultural goods is overwhelmed by consumerism and bad taste. Lacking sophistication and understanding, the public is overexposed to mass "cultural" brainwashing. In a marketing-dominated environment, the true culture is marginalized. Anything goes that generates profit. The movie industry, the literature, the pop music, as well as all other tools and means of popular pastime, including sport events and spectacles, are controlled by profit-based logic ignoring true entertainment value, excellence of the performance and social value.

Destroyed social life: There are more and more broken families and lost individuals all over the world. The traditional institutions like family, religion, and trusted media are losing ground. There is a lot of mass immigration going on with a reportedly great effect on mental health of migrant population. Trust and solidarity are scarce, most people are engaged in opportunistic friendships, and marriages are broken more often than stable. A lack of communication and exposure to distorted values lead to mass shootings, omnipresent terrorism threat and a growing number of depressed and alienated individuals. We used to love people and consume things, now it is just the opposite. We used to trust our neighbors, now we build walls and wires to protect ourselves.

Obviously, there are many signs that the world is broken. One of them is the fact that "unprecedented" has become the typical word in daily discourse. What used to be strange, wrong and unacceptable is now the new normal.

With the events of 2016—Brexit, the election of Donald Trump, threats from terrorists and cybercriminals, climate change, and the adoption of digital technologies that connect our lives with the marketplace and global environment— business leaders have entered a new era requiring new ways of leading. Traditional management methods are insufficient to address the volume of change and interconnectedness we are experiencing in the business and related ecosystems.

Today people, events, things and machines connect in the digital world and communicate. Everything is networked in real time via grid or the cloud. Change is compounded as it builds on changes in related ecosystems. Life with constant connectivity and interactivity among

people, consumers, employees, and leaders in business, politics, media, health care, finance, national security, and global trade generates compounded and exponential change.

It requires a new mindset and methodologies to navigate the environment in World 4.0. It is the world where catalytic changes across all institutions interact, building upon each other to generate exponential transformation with unpredictable outcomes. It is characterized by intensity and scale that have never been experienced previously. Here are some of the key World 4.0 features (Kaufman, Srića, 2019, p. 28):

- Lightning speed and exponential pace of change in technology and the environment
- Reaction cycle has drastically shortened; decision must be fast and agile
- Command and control has been replaced by open-source and rapid response
- Values and ethical compass that we depended upon and accepted have been violated and broken
- Management methods are “overwhelmed”: they can’t handle the volume of information and change
- We used to believe that business decisions are somewhat predictable; now, decision makers makes challenges with unknown consequences
- Decision making requires a new mindset which is not focused on the probable but on what is the possible
- Bureaucracy must give way to innovation.

3 Towards the Solution

Today most executives (business, nonprofits, and government) feel uncomfortable and struggling with the exponentially changing and growingly uncertain environment. Such environment is called VUCA (Bennett, Lemoine, 2014) because of Volatility, Uncertainty, Complexity and Ambiguity that surrounds business leaders, entrepreneurs and ordinary people. We believe that a reset from VUCA to PACE is needed, as a positive approach to navigating the modern world. Each “problem/emotional reaction” faced by decision makers must be replaced with practical next step: namely Volatility should be balanced by Purpose, Uncertainty calls for Agility, Complexity can be overcome by Collaboration, and Ambiguity can be addressed with Elasticity, as presented in Table 1:

Table 1: From VUCA to PACE

VUCA Realities	PACE Reset
Volatility	Purpose
Uncertainty	Agility
Complexity	Collaboration
Ambiguity	Elasticity

On the individual level, the new leaders (we call them Catalyzers) must have capacity to be fully present, mindful, and attentive to the stream of information that flows to them and through them. In addition, they must be realistic regarding attributing meaning to circumstances, and able to recognize both opportunities and dangers that are present or likely to emerge. They should maintain their clarity and balance in the midst of highly turbulent

circumstances, and thus be more resilient and adaptable in responding to emerging realities. Finally, their task is to clearly perceive a greater range of interpretations and options for action and inspire others to explore and adapt.

On the organizational level, Catalyzers must be equipped to deal effectively with the business of making sense of their data stream and knowledge management. They should be prepared to anticipate and plan for the future as well as to manage critical processes and resources. In general, they must be able to create healthy, thriving organizational cultures and inspire people with the knowledge and skills necessary to optimize the flow of their personal attention and energy at work.

Let us compare the transition in executive approach from current VUCA Realities to a PACE Reset. In challenging disruptions as negative energies/emotions, we redefine the realities as assets. Therefore, Catalyzers must transform their view of the business environment based on the PACE directives:

- **Purpose:** Because constant change fuels volatility, it is imperative that management laser focus their team on their Purpose, a constant vision of the future. Purpose (reflected in corporate values and mission) gains power as it is adopted and integrated across all functions. **Purpose rebalances volatility.**
- **Agility:** Today's leaders facing uncertainty and volatility must be agile to deal with changes rapidly, flexibly, and ethically. Even though strategic business plans and forecasts can be useful, they should be abandoned when they impede innovation. Companies must maneuver and act quickly to leverage opportunities or to respond to competitive threats without rigid adherence to bureaucratic procedures. **Agility integrates uncertainty.**
- **Collaboration:** In the face of complexity, the organization must refine and expand on "collaborative teams" able to address the new forces and challenges. Collaboration within the company (between departments and functions) and externally between the company and their customers, suppliers, academic institutions, and even competitors is the key driver of innovation. Using the vast opportunities for connectivity, companies that are open to cross-industry collaborations will be able to leverage innovation to drive exponential growth. **Collaboration diffuses complexity.**
- **Elasticity:** Businesses facing ambiguity must expand beyond their reactions to the new realities. Catalyzer must be resilient to develop their understanding of the needs and expectations of all their stakeholders. This includes customers, employees, partners, and community, to ensure that the Quadruple Bottom Line, the four Ps of sustainability (people, planet, profit, and prosperity) is met. **Elasticity allows for ambiguity without reactivity.**

After reading the signs of the broken world, we must be prepared to fix it. We propose the values and model of Strategic Harmony to drive transformative strategies necessary to rebuild the broken institutions of our world.

4 The Strategic Harmony Model

Successful transformation requires a realignment of values, purpose and mindset. It is a spiritual commitment to change the way we think and manage, and it takes courage. It is a high-risk operation because traditional executives don't have experience in changing values or letting go of control. The needed spiritual change is threatening to the soul, ego, relationships; equality reigns, myths broken that support their past actions.

Let us examine how strategic interfaces with harmony, and why we use that expression. We call it “Strategic” because it is driven by specific intention to create a values-driven plan that is inclusive and trusting, empathetic, sustainable and transparent. We call it “Harmony” because it is a congruent combination of diverse elements and mindsets resulting in unified, collaborative outcomes, shattering our status quo (Srića, 2014).

How do we transform these forces into strategies that change leaders and organizations and drive sustainable social impacts? Our journey has five modules. Each supports the objective of attaining Strategic Harmony and builds upon one another. It starts with DRIVERS and ends with LIGHT Outcomes. Our approach balances Power and Love and applies the TEST Values to drive the transformation process.

Let's take a short dive into each module (Kaufman, Srića, 2019, p 56-72). Our goal is to demonstrate that elements of this model are operational in diverse sectors and organizations globally.

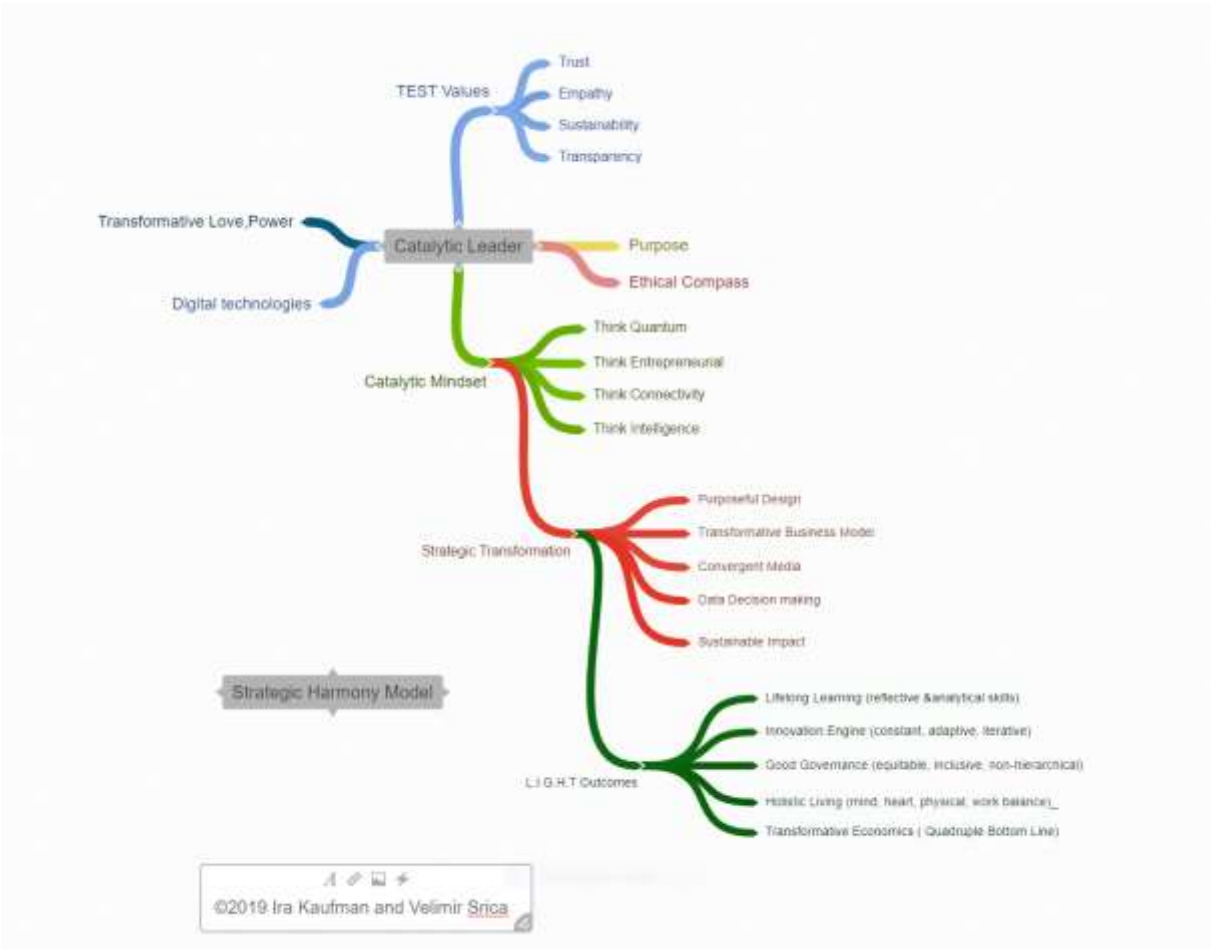


Figure 1: Strategic Harmony Model

4.1 Drivers

What drives individual and organizational change? Our model starts from the Drivers, the ignition of the Strategic Harmony process. Since everything that we do is guided by a constant balance between Power and Love, we use these two forces as the focus to the catalytic process that fuels change. We see a path to *Strategic Harmony* initiated with two factors driving change and affecting leaders and organizations:

- **Transformative Love and Power**
- **Digital Technologies**

The Drivers reflects the Chinese **yin yang** that describes how the opposite forces give rise to each other as they interrelate to one another. Transformative Power is a major driver in World 4.0 organizations. We contrast Old Power (Heimans, Timms, 2019), garnered from outside sources (position, family, money) and controlled, with Transformative Power generated from both inside (beliefs, values, ethics, and purpose) and outside (information/data and digital assets) and the resulting Transparency. We contrast the Old Love which is selfish and controlling with the Transformative Love which is supportive and enriching. The Old is like a chain, the Transformative gives you wings. When combined, Transformative Love and Transformative Power are the heart and soul of change that will fix our broken world.

These Drivers are not new to this age; but today they are significantly affected by explosive digital technologies, and transformed by our access to real time information, and instant transparency of data; how we reflect on it; leverage it; and judge it - giving powerful feedback to our institutions and leaders.

Digital technologies are coupled with Catalytic Leadership as the Drivers initiating change based on a transformed mindset, responding to market and environmental disruptions, as well as to the rising voices of citizens and customers. The actual change is faster, constant, and overwhelming; it disrupts our essence and transforms how we think and act!

4.2 TEST Values

How will the Drivers drive? Where will Leadership take us? It depends on the beliefs and values. We believe that transformation starts when an organization manages to pass the TEST (Trust, Empathy, Sustainability, and Transparency). These values should be aligned to an ethical standard, a compass that goes beyond local cultural morals. The TEST integrates values and ethics to benchmark the strength and potential of an organization to bring forth change in the marketplace or society. The TEST values of each individual should be congruent, harmonizing with the values of the organization.

Here are a few examples of how these values drive change. In last week of November 2018, in three corners of the world, people were expressing their distrust of the system and calling for Empathy and change. In the Ukraine, corrupt politicians were physically put in garbage dumpsters in protest; in Paris yellow vests were fighting with police on the Champs-Élysées

over heightened cost of diesel; and at the US-Mexican border, migrants were tear-gassed, protesting the blocking of the US border for asylum. Movements like Occupy-Wall-Street or #neveragain, or #Me2 grow from an inspiration to a political change platform; they establish their core values and laser focus on their purpose to generate grass roots power. In all the above cases, calling for Empathy and unwavering Trust is a source of Transformative Power.

Empathy triggers active listening, caring and focus on the citizen's or consumer's needs. It opens up the door for any team to go beyond their boundaries and limited point-of-view. It is based on unlearning typical assumptions and traditional beliefs about problem or its solution. It allows the individual to become open to pathways of thought and connections resulting in transformative business models.

Sustainability is a value, state of mind and physical condition. It connects all ecosystems and networks to optimize the outcomes for all stakeholders. The resulting collaboration reveals new strategies and technologies that help achieve their purpose. In the case of #NeverAgain movement, their purpose is to create a safe, sustainable and harmonious society. To sustain it across the connected generation, the students morphed and expanded their messaging from solely "gun control" to commitment to vote and make their voices heard on gun control. Such networks are a source of Transformative Power to communicate and mobilize various initiatives around their Love of purpose and importance of Why (Sinek, 2009).

Transparency is a child of the digital media movement resulting in open and challengeable content and explosion in personal data. It allows organizations to develop deep understanding of the individuals, who they interact with, and the ability to connect with them in a more efficient and meaningful way. Data and analytics are a source of power. Digital assets can be abused, as in the recent case of Cambridge Analytics interference in the US elections, or speed up the revolution in health care through telemedicine, predictive diagnostics, wearable sensors and new apps that transform health management. Recent research (<https://www.grantthornton.co.uk/insights/the-business-case-for-trust/>) points out that operating legally is not enough for an organization to sustain trust with employees, customers and investors. Instead, long-term success calls for a more ethically-driven approach. On a variety of issues (e.g., taxes, use of pension funds or zero hour contracts), companies claiming to be acting within the law have been heavily criticized, due to changing expectations concerning the business-society relationship.

4.3 Catalytic Mindset

Catalytic Mindset consists of four "think lenses". Each lens asks from us to reset the way we think and the way we approach a threat or opportunity. The Catalytic Mindset is authentic, open and values-driven, focusing on organizational purpose. In contrast, the traditional company's mindset is driven by Old Power, controlling communication, consumer and employee input, market strategies and product design. In organizations facing transformation, the executive team must determine a clear purpose to define its goals and direction. In our *Strategic Harmony* framework the organization's, WHY becomes the soul and spirit of the

organization, generating Transformative Power. The following table provides a snapshot of the four think lenses - the actions they drive and their solutions.

Table 2: Four Catalytic Mindset Think Lenses

Lens	Major Actions	Solution
Think Quantum	Adjust anchors/assumptions; disrupt old patterns	Creativity challenges old beliefs and stimulates divergent/critical thinking
Think Entrepreneurial	Re-invent business model	Lean methodologies combined with readiness to learn by mistakes
Think Connective	Leverage networks and digital assets	Connective mindset and networking
Think Intelligence	Optimize data points and analytics	Data are collaborative tool used to evaluate impact and guide decisions

4.4 Strategic Transformation

The next module generates a roadmap for Strategic Transformation to design, guide and support initiatives to fix what is broken. These activities must be authentic and aligned with the values and mindset which serves as the foundation. They drive the concentric circle of organizational activities that lead to change. Strategic Transformation incorporates four strategic solutions, namely organizational change, purposeful design, digital transformation and quadruple bottom line.

The leadership must start with the intention for **Organizational Change**; it incorporates values and a culture of rapid innovation, experimentation and risk taking. They must create a vision of the idealized organization and articulate how team members can share thinking and collaborate productively as a core competency to support the organizational structure. The clarity of an open organizational culture generates Power to attract talent and reset the organization for change. Adobe (<https://inside.6q.io/seven-examples-of-companies-with-great-internal-culture/>) has created great internal culture for change. They offer company perks- onsite yoga and cafes, paid family vacations and health care. Their Kickbox program gives any staff member who requests it, a red cardboard box filled with stationary, snacks and \$1,000 pre-paid credit card to explore their idea, no questions asked!

Purpose-driven Design inspires teams to integrate the organization’s purpose and values across all operations to generate innovative business models. The design process uses *Quantum Thinking* to challenge assumptions and deconstructs the fixed mindset. If company is **empathetic** and **listening** to its stakeholders and diverse touch points, they will be hearing the needs and integrating the feedback into their business model. Finally, it collects and interprets insights to design transformative business models. Tesla’s practice of [Purpose-driven Design](#) starts with questions: Why do we exist? Why are we making electric cars? Why

does it matter?" As an answer in mid-2016, under Elon Musk's leadership, the company changed the corporate mission to "accelerate the world's transition to sustainable energy." This Purpose drives every design decision. It can expand or contract depending on desired outcome. For Tesla, everything from how to install charging stations worldwide to the interface design of the digital dashboard is guided by individual Purposes. The final design aggregates all the mini Purposes, as Tesla engages in accelerating the global transition to sustainable energy.

Digital Transformation is aimed at developing an integrated strategy that is focused on leveraging digital connectivity, incorporating data to augment 'values-driven' decision making, collaborating among inter-generational teams, and driving a superior customer experience and brand loyalty. Digital Transformation translates values and mindset into a transformation of the **organization's structures, operations and strategies**. Connective Thinking is the lens that transforms products and services into networks and platforms. Networks scale the personalization and distribution of messages and physical products while technological innovations transform the business ecosystem. Aligned, they drive change.

Quadruple Bottom Line requires that organizations replace the traditional Key Performance Indicators (profit, revenue) with Sustainable Impact Indicators (SII) taking into account interests of all stakeholders. The goal of each organization is to focus on a balance of 4Ps: **People** (customer, citizen, employee), **Planet** (environment), **Profit** (value generated), and **Prosperity** (community). For the most part organizations (profit, nonprofit or government) do not have the intention to create sustainable change, social impact or a win-win situation. Most often, they focus only on short term goals of event turnout, brand awareness, or profit. The journey to change begins with transforming their values and organizational purpose to inspire customer/client loyalty, fuel sustainable impact and catalyze change. All stakeholders are united by **loving their purpose**. The teams being passionate and in love of the purpose and values generate Transformative Power, a key ingredient in building exponential impact.

4.5 Shed LIGHT on Community and Society

The integration of values with the mindset and operational activities brings purposeful solutions at the societal level. We call it the principle of L.I.G.H.T. and it provides harmony and sustainability to any organization or business (Kaufman, Srića, 2019, p.193-195):

- Lifelong Learning
- Innovative Engine
- Good Governance
- Holistic Living
- Transformative Economics

Each of these impacts works both independently and interactively to propel change, heal and illuminate organizations through the TEST Values. If we "place LIGHT" on our darkened organizations, transformation is initiated, realigning their values and actions with purpose, reenergizing them and bringing them to life. The principle of LIGHT brings balance and

sustainability to organizations when incorporated into the design of social ventures, businesses, community action groups, and institutions as they strive to transform.

Application of LIGHT principles is a set of tools used to transform an Old-Power-based organization to a flexible Transformative-Power-and-Love-aligned environment. Let's briefly describe the impact of each component.

Lifelong Learning is the individuals' ongoing, self-motivated quest for knowledge and inner growth. It serves as the foundation for individual transformation resulting in expanded creativity and innovation, active citizenship, self-sustainability and employability. Lifelong Learning is an economic imperative in the world of exponentially transforming technologies, changing jobs and required expertise. It goes beyond new technological and management skills; it focuses on self-improvement of communication, interactive soft skills, time management, decision-making, leadership and relationship building. The speed and necessity of change requires us to informally learn reflective, values based skills, teamwork, collaboration, digital analytics and technologies. Integrating Lifelong Learning is a requirement to navigate the path for *Strategic Harmony*.

Innovative Engine is the venue for facilitating continuous innovation - adopting exponential technologies to meet new requirements, unarticulated needs, or disrupt existing markets. The Engine reflects the organization's innovation strategy. It could be one or a combination of best practices: decentralized autonomous teams, internal entrepreneurial ventures, corporate venture-capital initiatives, outsourcing alliances, open innovation and crowdsourcing, or rapid prototyping. The Innovation Engine must be harmonious with business model, continuously engaged in searching for fresh or disruptive solutions. Constant innovation is realized by unbridling the thinking process, expanding technologies, reinventing business models that breakthrough, disrupt, and make a meaningful impact in the market or society. The best examples are *Change the World* companies listed by Fortune (<https://huffingtonpost.com%2Technology-and-millennials-are-driving-business-strategy-and-social-change>). They retain top talent, learn to navigate new markets, form new partnerships, and enhance their brand. Communities benefit through access to technology, capital, skills, know-how, supply chains, and partnerships.

Good Governance reflects the structure and lines of communication among and between the stakeholders of an organization. It embodies an active voice in decision-making, representing the diverse interests of all stakeholders. It encourages broad participation and depends on radical empathy or getting to the "roots" of what employees or citizens want and need. It must discover their real voice. Good Governance must be equitable in structure, transparent in communications and encourage feedback. A good example is Principles of Good Governance (<https://www.coe.int/en/web/good-governance/12-principles>) provided by Ministers of the Council of Europe. They reflect a high standard in addressing ethical conduct, rule of law, efficiency, transparency, sound financial management and accountability.

Holistic Lifestyle is concerned with the interaction of individuals and organizations with the community and society. A vibrant and engaged organization will be aligned with its purpose and strive to fulfill its goals. It is the set of tasks and techniques used to maintain health, work balance, as well as fulfillment of purpose for individuals and organizations. It reflects the

natural, environmental and allopathic treatments to heal the mind, body, and heart of an organization. Health starts with the individual as a holistic system - emotional, financial, cultural, and physical. All stakeholders should understand the culture, structure, policies, and operations of the organization, in order to recommend solutions that enable the organization to achieve sustainable outcomes in the community or society. As an organization adopts transformation, it experiences a “lifestyle challenge” and becomes a champion of its new adopted culture. Good examples are corporate wellness and fitness programs as the center of work-life balance from FitBit, Google, Houston Methodist, Motley Fool, and Zappos. They give employees the tools and opportunities to live a healthier, fulfilling lifestyle, and provide challenges that drive collaboration and improve health.

Transformative Economics realigns the business model and the related principles that guide the institution and organization to become the “servant” of its stakeholders rather than the “master” of them and the environment. The translove purposeformative economic model is inclusive and equitable, benefiting all stakeholders. It requires the exercise of power within the entire supply chain. It channels power as a transformative force for a collaborative economic model. All economic activities are designed to generate social impact while contributing to the development of a sustainable society within resilient ecological systems. It contrasts the “green economy” with “ecological economics”. The former attempts to reduce negative impacts (e.g. recycling) within the current capitalistic systems; the latter views the economic system as holistic and circular with products proactively designed to be reused.

5 CONCLUSION - Journey, not Destination

Strategic Harmony is a journey, not a destination. It is a transformative business model for organization and social change. Old Power, competition, conflict and the Darwinian survival of the fittest drive our present culture. It forces companies to do whatever it takes to make profit and grow, be it cheap child labor, wars to protect economic interests, or ecologically disruptive resource utilization. It makes the society insensitive to a growing gap between the rich and the poor and leads to an overall lack of humanity and solidarity.

Strategic Harmony is a blueprint for an equitable economy and society able to overcome the conflict-based and anarchic nature of capitalism, and shift the focus from competition, growth and profit toward mutual benefit, love, well-being and sustainability.

There is a strong need to rebuild the broken world. Our model presents a set of solutions and tools, but it takes strong leadership to accomplish the goal. There is no alternative to individual initiative and collaborative action. We must live the proposed values to start this process; take initiative and contribute through our own actions. We need to leverage the digital media and communications to spread the message and transform broken values on which many of our institutions, products and services are built.

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Using Knowledge Leverage and Enterprise Architecture in Transforming Consulting Business

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Abstract: A consulting unit was in crises. It had lost its preferred position in a monopoly market. Other consulting entities were more favoured because of their proximity. The management asked enterprise architects to analyse the situation and provide options in restoring the market share. The architect's primary framework, TOGAF, explains how to create views for the management but does not support the description of business competition, the social context of consulting, market, or knowledge creation as the leading manufacturing process. Therefore, we created a conceptual architecture trying to explain the consulting specific constraints and opportunities. Furthermore, we advised in the possible journeys to regain the trust of the client and restore the market share.

The research followed the consulting unit over three years supporting their efforts. We used a case study method to collect data, constructed a conceptual architecture, and conveyed findings with management viewpoints. While promoting the business transformation of the consulting unit, the conceptual model proved its feasibility in practice but also against the class of criteria set to enterprise architecture. Therefore, we discovered a practical architecture model for consulting business to support the analysis of the journey until today and help in foreseeing future opportunities even in a crises situation.

Keywords: Business Architecture, Knowledge Creation, Transformation of business, Consulting industry.

1 Introduction

A consulting unit was in crises. It appeared that the market, the unit was providing consulting services to, had entirely changed. Even though the market was closed, the monopoly status of the consulting unit was gone. There were no trusted relationships with higher authorities to force the lower levels of the client's organisation to prefer the unit's services. Other embedded consultants were favoured because of their proximity. New companies were entering the market through better high-level relationships and providing more holistic services than the unit's resources permitted. The new rules of the market made the former business model and most of the in-house consultancy assets irrelevant. How to transfer the consulting unit to survive the change?

Business architecture frameworks seemed to provide tools to analyse what has happened and promote options for transformation. The available architecture models (TOGAF, Zachman, NAF) contributed views to strategies, processes, information and technology. Whereas, their sociological, cultural, and information management views were not meeting the challenges of modelling the multinational, diversely competent and culturally dispersed unit (Dupuy, 2004, pp. 161-164). Consequently, a socio-technical system architecture model was required to help to analyse the consulting business and supporting the needed transformation.

This paper explains the composition of an architectural method, used to support of the consulting unit, and how the method was used in the case study to analyse the business situation and support the planning and execution of the transformation. Moreover, how well the created artefact was fulfilling the requirements of the case study and requirements for generic enterprise architecture model.

The business of consulting is fundamentally a knowledge creation activity (Nonaka & Takeuchi, 1995) that depends heavily on relationships between institutes and people (Schein, 2010). The challenges which consulting tries to solve are complicated further as the business in focus becomes more networked, international, and cyber-physical (Schwab, 2016). In this case, the transformation of the consulting business should address social challenges through the consulting value stream. Since TOGAF (Desfray & Raymond, 2014) does not directly discuss the ways to describe the evolutionary nature of consulting business (Korhonen, Lapalme, McDavid, & Gill, 2016), this paper presents an industrial architecture model for assessing the past and future roadmap for a consulting unit.

The proposed architecture model for consulting business explains how to analyse the environment and five interconnected layers of business architecture, namely layers of business, culture, collaboration, processes and content. In the given context, the model answers questions of:

1. Where the business has evolved to reach the current situation and
2. What opportunities or challenges business faces when developing towards the future?

The architecture model focuses on the knowledge creation and social aspects of an architecture, which are substantial in the consulting industry. This research aims to extend TOGAF, providing business architects with a dynamic architecture model suitable to analyse a consultancy business and design its transformation.

2 Theory and literature review

2.1 Environment and context of consulting business requiring additional approach in enterprise architecture

The business of consulting is fundamentally a knowledge creation (Nonaka & Takeuchi, 1995) driven business where the transfer of knowledge depends on relationships between institutes and people (Schein, 2016). We created a value stream model for consulting using a knowledge creation process (Nonaka, Toyama, & Hirata, 2015) where the consult transfers knowledge to the client through socialisation (S) and externalisation (E) illustrated in Figure 1.

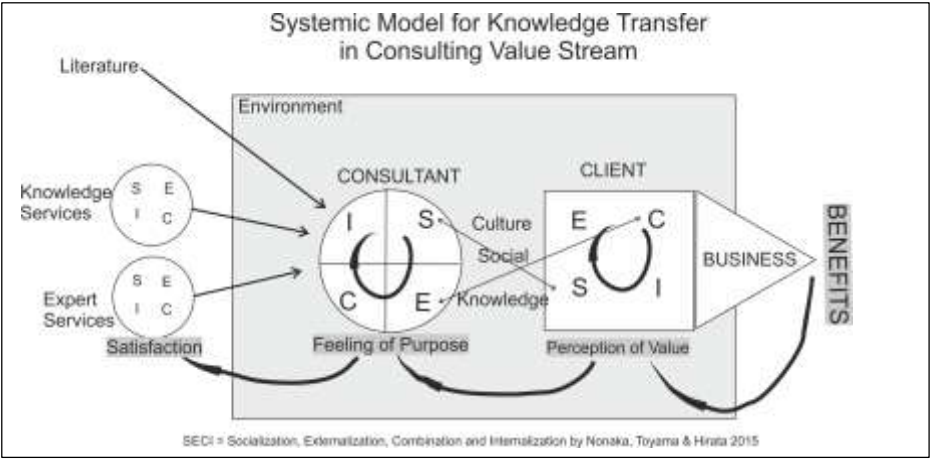
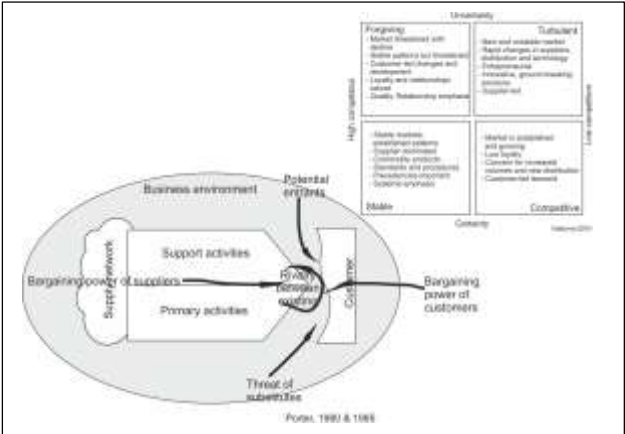


Figure 1: Value stream model for consulting based on the theory of knowledge flow (Nonaka, Toyama, & Hirata, Managing flow, 2015)

The exchange of knowledge between the consultant and client is either enforced or hindered by cultural, social and knowledge features (Hernes, 2014, p. 59). The exchange is reinforced (Rutherford, 2018) by the sequence of feedback-loops starting from client’s gained business benefits, which define their perception of value of the consulting, which gives consultant a feeling of purpose (as the consult aims to take care of the clients and solve their challenges) (Maister, Green, & Galford, 2000, p. 10). Advising the client in addressing their problems happens through the interface using the primary interactions of socialisation and externalisation. In socialisation (S), the tacit information of consultant and client is exchanged in a social event, where trust lays the essential foundation for the subject-object interaction (Covey, 2006). In externalisation (E), the consultant needs to transfer tacit knowledge first into the explicit format, communicate that to the client, who in turn needs to combine (C) different explicit information with his own experience. The combination requires the client to have skills of integration and conceptualisation (Nonaka & Takeuchi, 1995, p. 67).

The environment where the consulting – client interaction takes place can be defined with classical business modelling. We chose to use Porter’s (Porter, 1985, p. 37) models of the



business value chain and competition (Porter, 1980, p. 4). The competition model was further improved with Gattorna’s (Gattorna, 2010, p. 23) concept for different markets in Figure 2.

Figure 2: Business environment and market model for consulting

The challenge of consulting, in this case, can be defined as trying to solve more complex socio-technical business problems as they become more abstract, networked, international, and cyber-physical (Ross, 2016) in an environment that is becoming more competing and knowledge-based (Pritchard, 2014, pp. 20-28). Therefore, the model describing the transformation of consulting business should address more the value stream, knowledge creation, and social interaction challenges.

2.2 Gaps in the common enterprise architecture model in this particular case

Enterprise architects use different frameworks for enterprise architecture to solve the challenges of organisational transformations. For example, the NATO architecture framework (NAF) defines the value of architecture as follows:

Architectures are developed to support strategic planning, transformation, and various types of analyses (i.e., gap, impact, risk) and the decisions made during each of those processes. Additional uses include identifying capability needs, relating needs to systems development and integration, attaining interoperability and supportability, and managing investments.
(NATO, 2018, p. 18)

Therefore, at least in theory, there should be tools and models to describe consulting business in either of the three common architecture frameworks TOGAF (Open Group, 2019), Zachman (Zachman International, 2019) or NAF (NATO, 2018). Table 1 shows a brief comparison of the frameworks against the essential features discovered in the case of consulting.

Table 1: The common enterprise architecture frameworks addressing the requirements of the case

Frameworks/ Required features	TOGAF	Zachman	NAF
Value stream	Defined in Business process	Defined through Distribution	Defined as Capability dependencies
Knowledge creation/flow	Defined as Boundaryless Information flow	N/A	N/A
Competition	N/A	Could be with Motivation	Could be with Effects
Culture	N/A	N/A	N/A
Social relationship	N/A	Could be with Context	N/A

Unfortunately, none of the frameworks addresses the required features fully for enterprise modelling in the given case study. Therefore, we created an industrial extension for TOGAF framework mainly as a visual representation of the taxonomy for business architecture.

2.3 Build of the new views and an artefact

The model for the business environment and relationships uses Porter's (Porter, 1985) primary and supportive activities, apply them in the simple value chain, and introduce Porter's (Porter, 1980) competitive powers affecting the relationships between stakeholders in the market. Moreover, Gattorna's (Gattorna, 2010) model for competition and certainty of the market helps to analyse the nature of relationships. The Osterwalder and Pigneur (Osterwalder & Pigneur, 2010) business canvas extended with Gattorna's (Gattorna, 2010) block of value chain relationship helps to describe and to analyse the core business model. The Sniuka's (Sniukas, 2015) findings for five approaches in consulting is used to tailor the Porters generic model to model better the consulting business. Figure 3 illustrates the conceptual visual taxonomy created for the case.

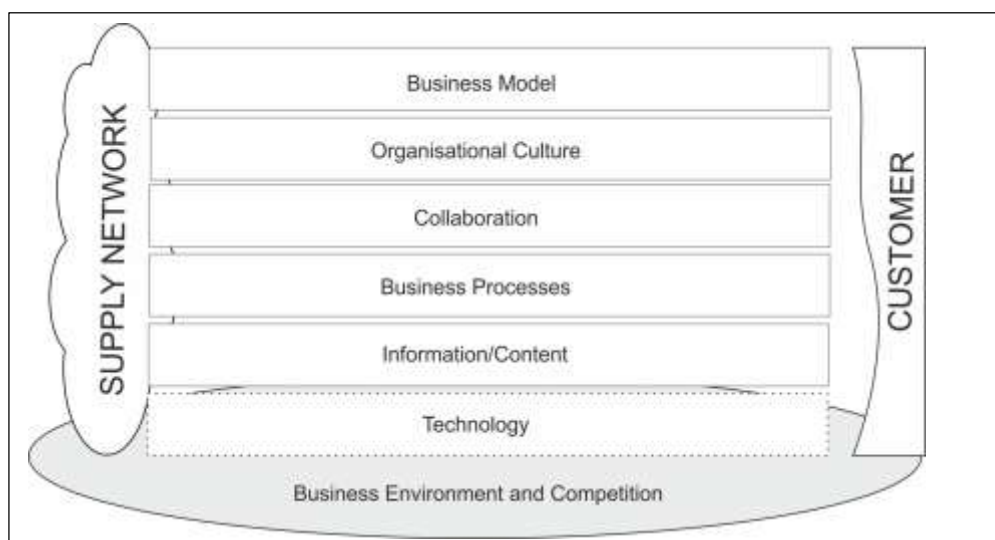


Figure 3: Concept for the model applied in analysing consulting business transformation

We replaced Porter's generic business model with a TOGAF like a layered model (Harrison, 2013) emphasising the required additional features of the consulting business. We need to model the culture, i.e., underlying beliefs, assumptions, values and ways of interacting (Champoux, 2011, pp. 72-75), both within the consulting unit and over the interface with the client. The collaboration between people assumably is the most critical ability of a consulting organisation because of its social nature and knowledge transfer according to the SECI knowledge creation model (Nonaka & Takeuchi, 1995). A business process is essential in describing the creation and delivery of value to the client. Since the information defines the product and service, the content management process becomes the most important in the consulting business. The technology layer described in TOGAF model (Desfray & Raymond, 2014) is left out from this research paper, but it was included in the actual transformation of the consulting unit.

In the full architecture model illustrated in Figure 4, the sociological features of the business system are modelled using Logan's (Logan, King, & Fisher-Wright, 2008, pp. 16-28) culture model providing five simple stages of cooperation maturity. For the collaboration layer,

Synapticity (Synapticity, 2010) provides four phases of maturity including both culture, process, content and tools views. When combining the ThinkingProcess (ThinkingProcess, 2009) and CMMI for services (Forrester, Buteau, & Shrum, 2011) models, the framework is provided with a business process model including three layers for processes, performance measurement and improvement. The evolution through all three layers can be pictured in four phases. Finally, Cameron’s (Cameron, 2012) model for enterprise content management, using people, process and system layers, assists in analysing the information and content management through five stages path of evolution.

The five interconnected layers in Figure 3, are described in more detail and armed with landmarked paths of evolution or maturity, they create a dynamic architecture model for the consulting business, as shown in Figure 4. The model below arms architects with value stream, knowledge flow, competition, cultural and social relationship descriptions to use in analysing the transformation of the consulting unit and communicating findings by managers views.

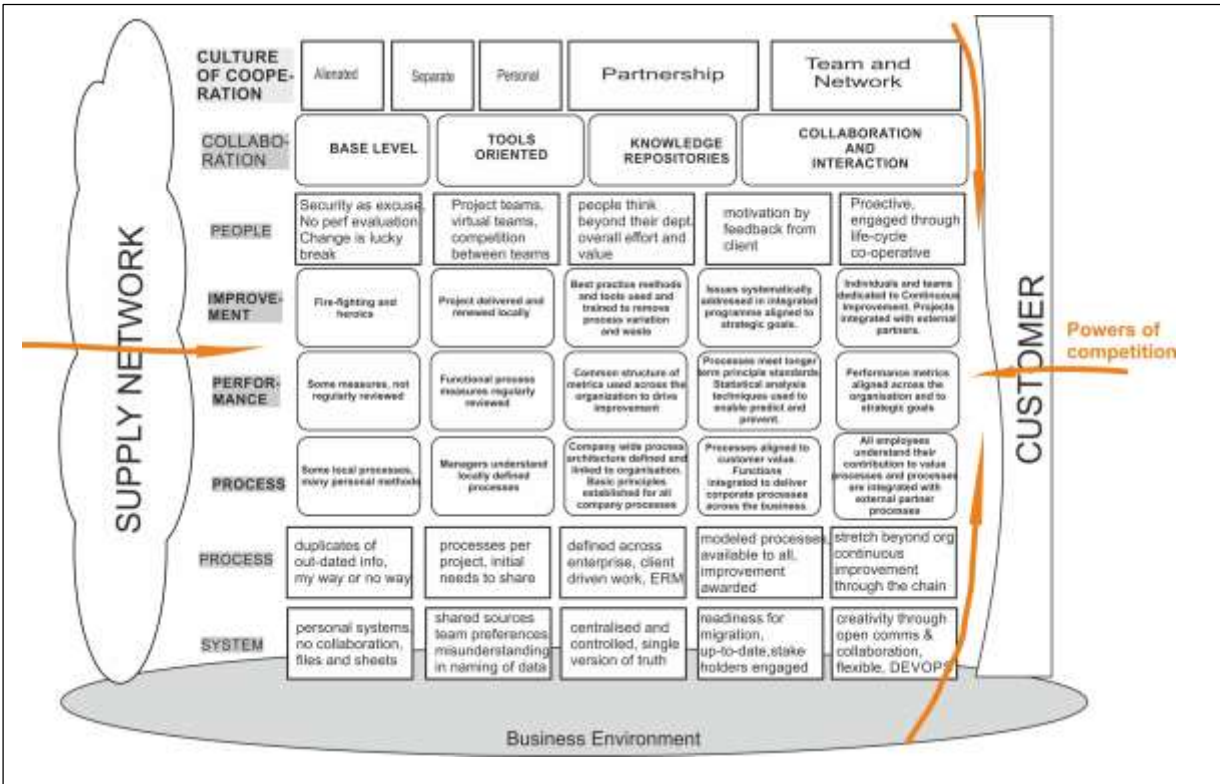


Figure 4: A model for the evolution of the consulting business

3 Research

3.1 Research Design

The research method approaches the challenge from a pragmatic view (Creswell, 2014) since the aim was to help the consulting unit in their business transformation using business architecture tools. However, the TOGAF and other EA frameworks did not include models to understand the evolution of sociological structures in a business context. Therefore, researchers needed to deduct a better fitting model at the beginning (Gummesson, 2017). The

components for the model were collected from literature research and merged in a layered, interconnected model during a few architecture workshops.

The model for consulting business explains how to analyse the environment and five interconnected layers of business architecture, namely layers of business, culture, collaboration, processes and content. In the given context, the model answers questions of:

1. Where the business has evolved and the current situation and
2. What opportunities or challenges the business faces when transforming towards the future?

The model focuses on the knowledge creation and social aspects of an enterprise, which are the critical capabilities of a consulting business. This research aims to extend TOGAF, providing business architects with a dynamic architecture model suitable to analyse a consultancy business and design its transformation.

Furthermore, the transformation of the studied consulting unit took over two years, so longitudinal horizon enabled either action research or case study. The case study won because it is less intruding and lighter of the two research strategies. The case study was executed between 2013 and 2015 while advising and architecting the transformation of a consulting unit as illustrated in Figure 5.

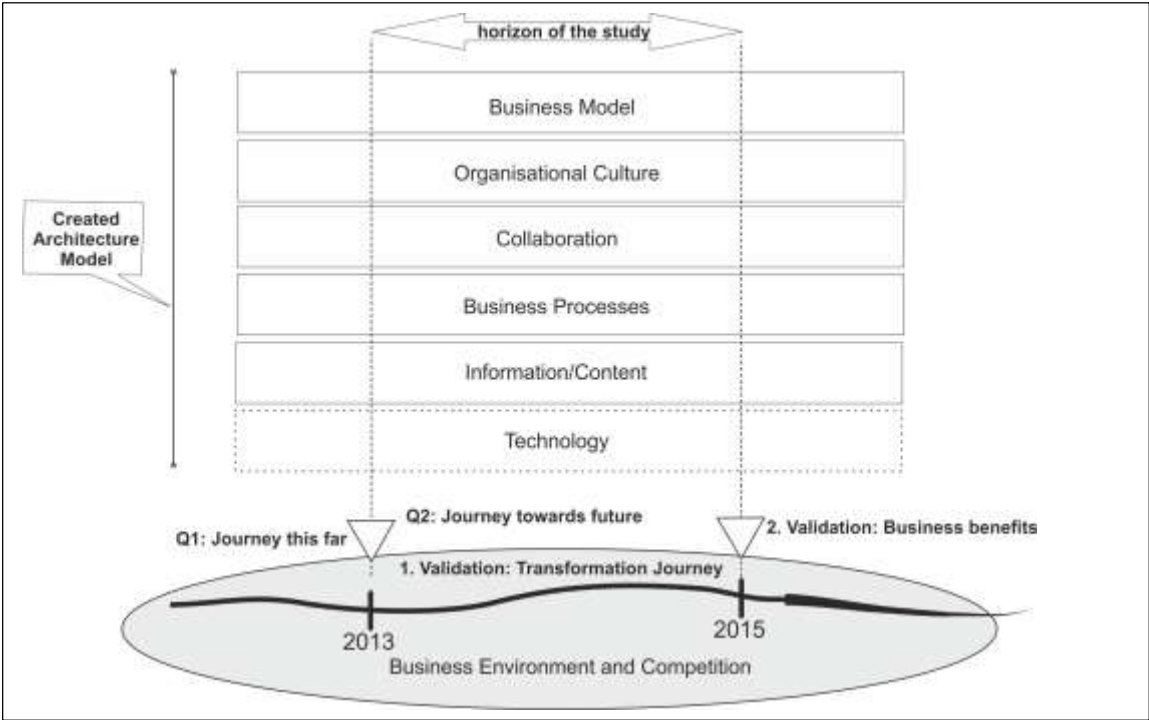


Figure 5: Framework for case study research method

Mostly qualitative data was collected from available records and using a series of workshops which engaged top and middle-level managers. The feasibility of the model was analysed against two points of validation: 1. primary usage of the model in implementing strategy and 2. secondary business benefits after the transformation.

The researchers provided architecture support continuously between 2013 and 2015, but mainly by having a series of workshops with the management team of 4-5 people. During

those workshops, we used the business architecture model together with the management group to analyse the situation, define plans, and measure the gained advances.

Having the researchers heavily involved with the organisation that they are studying, creates the problem of bias (Creswell, 2014). The triangulation fell short because there were only records and workshops to extract the data. Later, the business records validated the achieved gains, but we did not find a robust method of proofing the causality between the use of the created method and gained business results. We did check our findings by the members of the management group, which improved the accuracy of our significant findings and analysis.

However, the fact that we spent over two years with the consulting unit helped us to develop an in-depth understanding of the unit and its environment. Furthermore, the diversity of our backgrounds; a military from Finland and an engineer from Australia; possibly saved us from too one-sided interpretations. Similarly, the longitudinal research with the same management group ensured that we were able to share and validate the lessons with them.

3.2 Transformation case of the consulting unit

The consulting unit under study was founded in 2006 to support one primary customer in their major transformation projects. By 2013, the unit had grown with additional projects to over 40 people organisation with a substantial 40% margin for support activities. The unit in Figure 6 enjoyed a forgiving, monopolistic market where good relations between the unit’s management and the senior customer kept the perception of benefits delivered high. The consulting personnel were divided into small groups that were mostly embedded in their client's organisation to build the relationships.

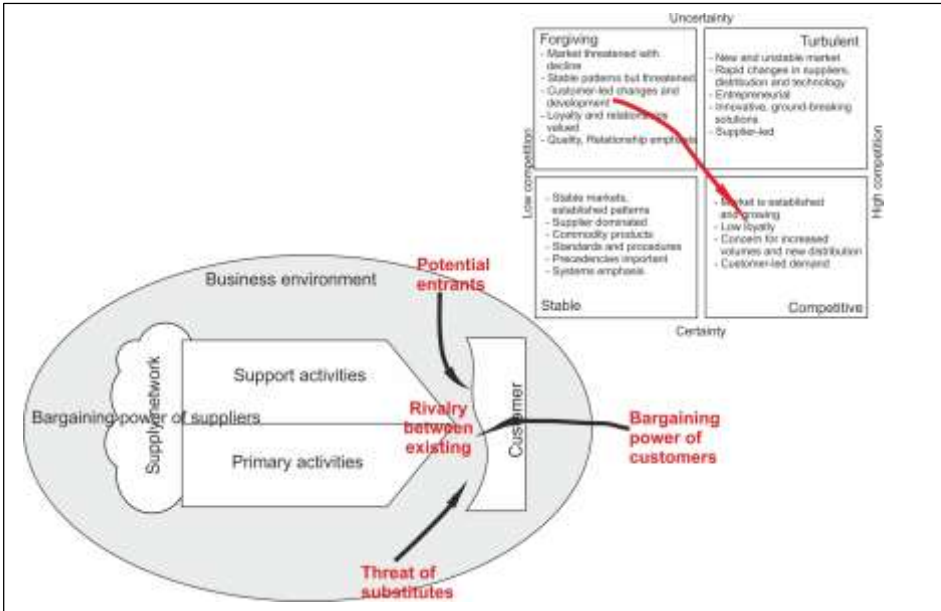


Figure 6: The change that made the consulting unit to transform

Then, the business and environment changed. The senior representative of the customer was replaced in 2012, the intimate relationship was lost, and the unit’s business environment changed from forgiving to competitive. The new management for customer preferred to give more freedom of choice to his subordinates who, of course, preferred to use consultants that were closer and more familiar than the units. The bargaining power of the client went high,

and there was no loyalty to build on. More personnel were hired directly to work with the customer, so the flow of potential entrants and substitute services kept streaming into the market. Moreover, the unit’s consultants become afraid of losing their steady income, and the competition intensified between each other and with newcomers, creating tense feelings, which further alienated the client.

During 2013, the executive management of the consulting unit was changed, support activities were reduced, and the board assigned new management to transform the primary activities of consulting services. The management asked two enterprise architects to support in assessing the situation and support in transformation. The support lasted until 2015 when the final assessment workshop was held, and the two-year journey was post-analysed with the same management group as started the journey.

The final survey of the journey is described in Table 2. The transformation plan was executed in parallel iterative steps while the management and lead consultants showed a visible example of a new kind of behaviour. Cultural changes were the hardest, and some isolated individuals and groups still sustained their old tribal attitudes. Performance measurement also faced cultural opposition as people were not used to be measured transparently before. Technical and process changes were successful, but the challenging competitive market was only slowly improving. The managers and lead consultants agreed with the primary outcome.

Table 2: Comparison of resource utilisation and transformation of the consulting unit between 2013 and 2015

Feature	Status on 2013	Achieved by 2015	Notes in Transformation
Environment	Forgiving	Competitive	Competitiveness still creates challenges
Business model	Classic	Flexible without external sources	Majority of hired consultants are used in a flexible manner
Culture	Separate from Personal	Partnership to Personal	Majority of consultants share the partnership culture
Collaboration	Base level	Knowledge repositories	Collaboration is continuous, and the process is driven
Process maturity	Ad Hoc	Almost aligned	Majority of knowledge creation follows continuously improving the process
Content management	Individual	Enterprise	The single version of the truth. Creation supported by ERM. People create content together for clients benefit.
Business value to Customer	N/A	Few	Customer admits that the unit is creating better value than before.
Solutions to challenges	Few	30	Clients challenges are solved and not only informed
Services to needs	None	Few	Service development is slowly emerging.
Embedded SME’s	25	5	Fewer people are embedded solo with client and majority work together in a flexible manner.
ADMIN	8-12	4	50 – 75% less admin marginal
IT Support	4	1	75 % less IT support with better security and availability

4 Results and discussion

The advising architects were using the hypothetical architecture model to analyse where the consulting unit had come to its current status, and what opportunities and challenges it faced on its roadmap towards the future. The time of strategy implementation and observation extended over two years. Therefore, it was possible to assess both the usage of the model and its business benefits. The architecture model met the Whittle and Myrick (Whittle & Myrick, 2005) criteria for architecture model benefits: strategic alignment, customer-centric focus, strategy to results connectivity, speed to market, team synergy, less rework and waste, and continuous improvement and feedback sufficiently. Furthermore, usage of the model, at least partially, produced the business benefits promised by the TOGAF (Harrison, 2013) framework: efficient business operation, efficient IT operations, return on existing investments, reduce risks for future investments, and faster and cheaper procurement. Therefore, the proposed dynamic architecture model for consulting business fulfilled all expectations set for a business architecture model in a single case study.

Table 3: Validation of the created EA model against criteria for enterprise architecture

Required feature from a business architecture model	Further explanation of a requirement	The validity of the created EA model during the case study
Strategic alignment	Illustrates the alignment of strategy, vision and objectives on a roadmap via milestones of transformation	Explains the change in business environment and give a clear basis for analysing current and needed phase for transformation
Customer-centric focus	Value to customer view first to overcome cost-only and internal politics views	Reflect the customer interface in consulting specific manner including the social aspects.
Strategy to results connectivity	Helps people, processes and technology layers transformation via realistic milestones.	Includes details of interconnected layers of people, processes and information with four to five clear phases of evolution.
Speed to market	Ensures the new value to market faster than competitors	Not tested in a case study.
Team synergy	Place where managers and employees can freely express their ideas and agree on ways and ends.	Build the bridge between business model and everyday behaviour, therefore, provided a gameboard for transformation discussions
Less rework and waste	Illustrate results, outcomes, interfaces and relationships	The artefact remained the same through the transformation.
Continuous improvement and feedback	Provides results from metrics and operational data to adjust development	The artefact provided strategy with tangible metrics to monitor the development of consulting unit.

5 Conclusions

The paper introduces a particular challenge in modelling knowledge-based business with traditional enterprise architecture frameworks. Therefore, researchers created an industrial specific architecture artefact for consulting business focusing mainly on cultural, knowledge creation and collaboration views essential in consulting. The created artefact was tested in a case study of transforming a consulting unit over two years from forgettable to a highly competitive market.

The created artefact helped to show the managers of consulting unit what change took place, where their consulting capabilities were at 2013 and what may be the new required capabilities in the future.

The created artefact provided managers and employees with a simple visual tool to analyse why their behaviour needs to be transformed, what challenges unit faces especially at cultural and social levels, and what opportunities they may be able to exploit during the transformation journey.

The consulting unit went through a painful but eventually successful transformation through transferring their culture of cooperation and collaboration, migration of their processes supported by new content management systems.

Finally, the created architecture artefact fulfilled almost all requirements for a full enterprise architecture model. Therefore, the artefact provided architects with a useful tool for consulting business even to build on further.

The dynamic architecture model for consulting business provides business architects with a simple interconnected layered structure that helps to assess business processes particularly from knowledge creation and cultural viewpoints. The TOGAF may consider the model as an industry solution with a socio-technical system approach. The model illustrates a landmarked roadmap for each layer as per their maturity, approach or ability. Therefore, it is easier to define the strategic paths for development based on previous achievements and possible future challenges. Consequently, the model may be categorised to a class of dynamic enterprise architecture (Korhonen, Lapalme, McDavid, & Gill, 2016) approach.

The architecture model for consulting business is still in use within the case study unit. Therefore, there is a possibility to have extended data of its business benefits or further proof of its feasibility in continuous improvement. However, no plans are existing to apply the tool in any other consulting company. Other researchers may find opportunities to extend the usage of the model. Currently, the architecture model for consulting business does not address the technical layers or their dynamic roadmaps. Therefore, more modelling and research are needed to fulfil these caps.

There were many other models available for example culture, process maturity, cooperation, and value stream modelling. For the pragmatic emphasise, these options had to be excluded from the research. Moreover, the model does not reflect sufficiently the systems thinking approach, which may reveal new views and models.

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Why Knowledge Cafes can be Valuable to Organisations

Abstract

This paper discusses research in to the knowledge café technique conducted over the last 10 years. The paper summarises knowledge sharing techniques similar to knowledge cafes and assesses some of the advantages and disadvantages of these techniques. The research builds on some early literature that identifies some of the advantages of the knowledge café approach. Respondents' feedback in this research confirm that the respondents who participated in the knowledge cafes with this researcher valued their experiences for a wide variety of reasons. This paper identifies and categorises these reasons using key verbs (in order of frequency of mention) as *sharing, creating/solving, enjoying, identifying, interest, connecting, learning, and changing*.

1. Introduction

In answering the question 'whether knowledge cafes are useful, and if so, how?' David Gurteen who had run many knowledge cafes across the world, said:

"There are so many things and it depends what the purpose of your knowledge café is. But personally, I find that the open conversation provides people with insights and changed ways of thinking that are helpful, challenging and stimulating. Also, different people take away different things..." (Gurteen, 2010, p.1 written note)

This response, along with several others from people who had chaired or participated in knowledge cafes before, led to this research about knowledge cafes. This research was conducted by the researcher as he participated in, and chaired, knowledge cafes over more than a period of 10 years in different organisations in London. In these knowledge cafes a myriad of different themes relevant to organisations, technology, business and world affairs were discussed.

The importance of this research is manifold. One aspect of the importance of this research is the need for effective knowledge and learning in organisations (e.g. Alavi *et al.* 2014; Chercione and Esposito, 2017; and Dymock and McCarthy, 2006). This can, potentially, build competitive advantage through better use of knowledge, learning and psychology (e.g. Hellstrom and Sujatha, 2001) and help organisations manage well when organisational structures change. For example in recent years, each year there have been trillions of mergers in the world (Lefika and Mearns, 2015) and a good understanding of effective knowledge sharing techniques is vital in such an environment. This paper considers research about one of these techniques: the knowledge café (Sharp, 2013).

This paper considers what a knowledge café is and how the technique compares to the range of different knowledge sharing approaches that can be used; examples of different forums the researcher has used the technique in as part of a cumulative research method for this project; feedback from participants; reasons why the technique is valued by participants; wider implications of knowledge cafes and potential for different approaches /uses of knowledge cafes in the future.

2. What is a Knowledge Café?

For the purposes of this paper a knowledge café is defined as “a frank exchange of ideas or views on a specific issue in an effort to attain mutual understanding” (Gurteen 2013, p.2). Normally, a knowledge café is conducted face to face in the same building. However, with modern technology (e.g. video conferencing using Zoom technology) there are arguably different versions of knowledge café concept which no longer require participants to be in the same room / geographical space. This paper discusses research relating to knowledge cafes conducted face to face, but also considers implications of other approaches.

‘Knowledge Café’ in this paper refers to face-to-face conversation conducted in groups, not computer systems that have been devised with the name ‘the Knowledge Café’ (Gronau 2002). The idea of a knowledge café is explained by Gurteen (Gurteen 2013). The process of the café is introduced and a question is posed. This should take no more than 20 minutes in total. Participants form groups of 4 or 5 to discuss the question for 30 to 60 minutes. The facilitator calls for change of groups which is normally done three times so groups have three conversations, each about 10-20 minutes long. After this, the whole group reassemble in a circle to continue the conversation until the end of the café. Participants should suspend assumptions and listen to one another (Gurteen 2013). This approach enables participants to address issues related to the overall topic area in a non-linear way. This enables participants to address issues as they arise in conversation rather than a linear way that it is a traditional approach to addressing topics or projects (Griffiths 2013).

Knowledge can be defined in many and various ways (Sharp 2003). However, it is clear that there are various characteristics that most professional employees agree are important to the concept and these are that it:

- “is human-based and particularly refers to the use of skills learnt through experience;
- is bound up with its organisational context and valuable when tailored to it;
- improves the effectiveness, value and/or competitive edge of organisations;
- is particularly valued when it is applied in its organisational context and;
- is also valued when it is possible to share it.” (Sharp 2008, p. 495)

The knowledge café format may or may not include a discussion on the meaning of knowledge, but these aspects of the concept of knowledge inform the terminology of knowledge café, and were used as a reference point in knowledge cafes the researcher facilitated in this research.

3. Different Knowledge Sharing Approaches

The knowledge café is one of many different knowledge sharing approaches. Lefika and Mearns (2015) define and classify different knowledge sharing approaches and they said in 2015:

“...the knowledge café is a fairly new technique for knowledge sharing [and] there is limited scholarly literature about the technique.” (Lefika and Mearns, 2015, p.26)

For a summary of knowledge sharing techniques see **Table 1**.

Table 1 Knowledge Sharing Techniques (adapted from Lefika and Mearns, 2015)

	Technique	Definition
1	Peer Assist	Peers get together for feedback /clarification/lessons learnt regarding a problem/issue
2	After Action Review	Review lessons learned to not repeat mistakes in the future
3	Retrospects	Gathering of a specific group at the end of a project to review events and learn
4	Intranets and Extranets	IT platforms for sharing learning internal to an organisation and internal and external to an organisation respectively
5	Knowledge Fairs	Fair to share knowledge on a particular theme using <i>inter alia</i> kiosks, presentations, panels and demonstrations.
6	Knowledge Network	Group of individuals share a common interest using formal methods (e.g. corporate policies)
5	Mentoring	Relationship between two individuals that focuses on guidance and learning
6	Coaching	Coaching focuses on developing specific skills to satisfy goals (Association of Coaching, 2011)
7	Formal Group-Based Knowledge Sharing	Approach of doing this by formal interventions; information sharing; questioning; and managing time to produce knowledge sharing, innovation and solve problems
8	Storytelling	Give accounts of incidents and events
9	Blog (or weblog)	Web pages with no external editing which provides online commentary periodically updated and presented in reverse chronological order
10	Chat Show	Informal fun Television style chat show format with one host and three or four guests and an audience of co-workers
11	Community of Practice	Process where a group of people share a common interest, problem or passion for a specific topic and get together and discuss the issue on an ongoing basis
12	Knowledge Cafes	See above and below

There is considerable overlap in some of the knowledge sharing techniques that Lefika and Mearns (2015) define. For example, there is little that differentiates techniques 2 and 3, and there is considerable overlap in techniques 5 and 6 (see Table 1). However, this classification gives a useful view of the range of techniques that an organisation may use and the knowledge café is one option it may choose. Lefika and Mearns (2015) also provide a useful classification of techniques similar to knowledge cafes based on their Delphi research (see **Table 2**)

Table 2 Summary of Knowledge Sharing Techniques similar to Knowledge Cafes (adapted from Lefika and Mearns, 2015)

	Technique	Definition	Differentiators
1	World Cafes	Cultivation of conversations to transfer knowledge and learn)	-Hosts of tables record conversations -Topics are community related -Multiple questions -Large group intervention -Individuals are encouraged to draw/take notes
2	Technology Cafes	Discussion by group of intervention of a new technology	Technology centred topics
3	Open Space Technology	Groups get together and then break down in to smaller groups and individuals can go to other small groups if they are not contributing to the conversation	Individuals can leave a group at any time
4	Dialogue meeting	Questions are presented for a group to work towards a common understanding	One large group from beginning to end

5	Brainstorming	Encouragement of individuals to generate creative ideas through group discussion. Lefika and Mearns (2015) cite Litchfield (2008) for a four-rule guide: i) generate a lot of ideas ii) avoid criticising ideas iii) attempt to combine and improve ideas and iv) encourage 'crazy' ideas	-One individual summarises for the group -Notes taken during brainstorming Sessions often recorded
6	Communities of Practice (CoP)	See above	-CoPs are continuous in nature and longer term (not one-off events) -There is one group from beginning to end
7	Action Learning Groups	Lefika and Mearns (2015) cite Association for Coaching (2011) to define it as people get together to analyse a work problem and develop a plan of action	The catalyst is a problem to be solved whereas knowledge cafes emphasise enquiry

There is considerable scope for overlap with these techniques too, and, one technique may be used within another. For example, brainstorming or drawing / taking notes of key ideas may be used within a knowledge café approach, unless the facilitator is very strict in how he/she imposes the knowledge café process (see Section 2.).

Lefika and Mearns (2015) provide guidelines for implementing knowledge cafes and various challenges in using the approach. These challenges include not asking appropriate questions and not being authentic (Prewitt, 2011). One of the challenges Lefika and Mearns (2015) comment on is 'disregarding the rules' which could lead to the knowledge café not being 'successful' (Lefika and Mearns, 2015, p. 30). However, one aspect of the approach is that the participants are not closed-minded and unwilling to explore different viewpoints (Gurteen, 2013 and Lefika and Mearns, 2005) so a lot depends on how the facilitator wishes to implement the knowledge café. For example, does the facilitator and/or those hosting the knowledge café want the plenary conversation at the end of the knowledge café to be recorded? And, if so, how? However, although this is the case, knowledge cafes have distinctive features, and have certain advantages over other techniques where people come together (Lefika and Mearns, 2015).

Literature suggests that knowledge cafes are useful in a wide range of organisational environments. Gurteen (2019) has shown that the technique can be used in a wide range of organisations of different sizes and type across the world. These include multi-national companies, charities, research institutes, and government organisations (Gurteen, 2019). Also, Gurteen (2019) integrates his knowledge cafes with his newsletter and website to support a Community of Practice (the Gurteen Knowledge Community). This means that the Gurteen Knowledge Community communicates by using a combination of different means including face to face, social media and Information Technology (Gurteen, 2019). Lefika and Mearns (2015) and Sharp (2013) illustrate that knowledge cafes can be used in higher education and business environments and Singh (2017) suggests that it can be used to conduct research and generate theory.

The example of the Gurteen Knowledge Community generates interesting questions relating to the interaction of knowledge cafes with Communities of Practice and the use of technology to support and complement knowledge sharing. Arguably, Communities of Practice (CoPs) are like knowledge cafés but continue longer with repeated meetings and use of technology where knowledge is shared (Wenger *et al.*, 2002).

The World Café is like a knowledge café that connects people around the world (Brown and Isaacs, 2005). Brown and Isaacs (2005) give stories of the benefits of this approach which encourages listening and working together with people from diverse backgrounds. The World Café approach encourages practical problem solving and removal of hierarchical structures (Brown and Isaacs 2005). There is an appeal in this book to the value of society and face to face meetings in groups that can be lost with the use of technology (Brown and Isaacs 2005). However, technology can support the development of discussions and reinforce the connection with people. Some examples include the use of blogs (Dennen, 2014), the development of virtual CoPs (Ogbamichael and Warden, 2018), the development of Networks of Practice using technology (Primard *et al.* 2016), continuing CoPs online (Cheung *et al.* 2013), and video-conferencing (Panteli and Dawson, 2001 and Maul *et al.* 2018). Also, whether technology is involved or not, an interesting area of discussion is the value of crossing boundaries of CoPs to innovate and create ideas (Leino *et al.* 2017).

Both CoPs and knowledge cafes usually entail learning about a particular theme or area of concern or interest (Lefika and Mearns, 2015 and May *et al.* 2016), and, as discussed above, there is overlap of the two (e.g. Gurteen, 2019). This research explores further why knowledge cafes can be useful to organisations. This research was conducted without reference to Lefika and Mearns (2015) but will add to literature on the theme of the value of knowledge cafes to organisations. Lefika and Mearns (2015) specify eight advantages of knowledge cafes for organisations (see **Table 3**).

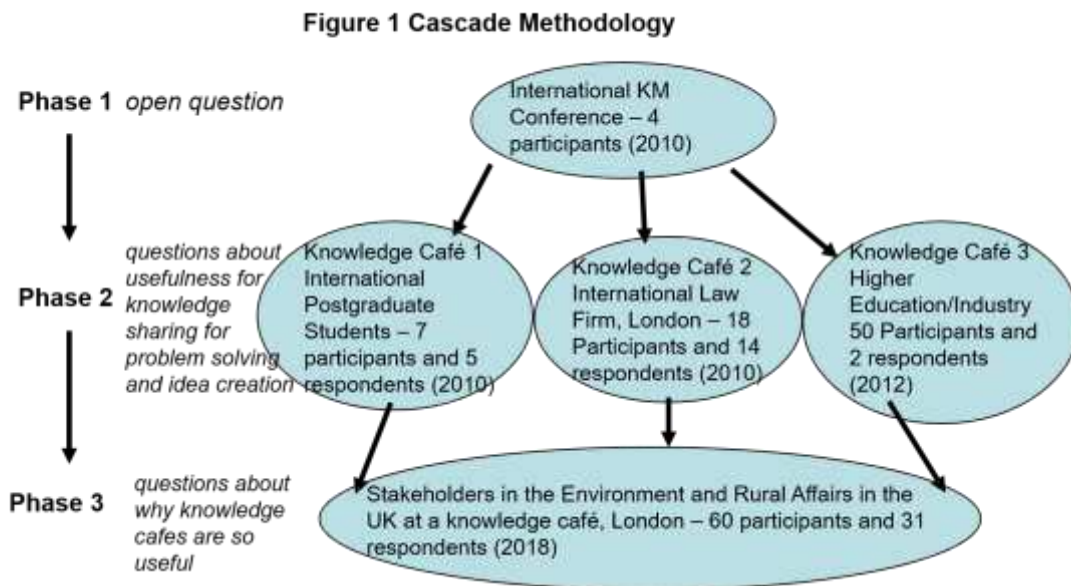
Table 3 Summary of Advantages of Knowledge Cafes for Organisations (adapted from Lefika and Mearns, 2015)

	Advantage	Notes
1	Connecting People	All experts part of the Delphi study saw this as one of the key advantages
2	Knowledge Sharing	Sharing happens once connections are made and this sharing can be used to train and help with mergers.
3	Leadership Training	Leaders can train through sharing experience in knowledge cafes
4	Mergers	Knowledge cafes can help merging organisations can communicate effectively with each other
5	Leaders Share Experiences	Often this is done through leaders sharing tips and tricks and stories
6	Creative Idea Generation	Knowledge cafes help generate ideas and build consensus but were less successful in solving technical problems
7	Change Management	Experts thought it may be helpful for this
8	Learning and Understanding	Knowledge cafes have helped postgraduate students grasp concepts better than in a normal classroom setting

This paper will present further research conducted separately from Lefika and Mearns (2015) and discusses the implications of this research in light of the above literature.

4. Cumulative Research Method: Different Knowledge Cafés and Feedback

The methodology for this research can be viewed as a cumulative approach where one stage of the approach built on another (see **Figure 1**).



Phase 1 – Interview with Four Experts

The researcher interviewed four experts at an international knowledge management conference (European Conference on Knowledge Management) in Autumn 2010. Each person was asked to give a view on their experience of knowledge cafes. Each interviewee said that they valued knowledge cafes for a variety of reasons (see **Table 4**).

Table 4 – Phase 1: Reasons Given for Valuing Knowledge Cafes

Person	Job / Role / Responsibility	Reasons to Value Knowledge Cafes
1	Business consultant, UK (David Gurteen)	<ul style="list-style-type: none"> Insights / changed ways of thinking / challenging /stimulating Surprising benefits (see Section 1)
2	Senior Lecturer, UK university	<ul style="list-style-type: none"> Synthesis of ideas Creation of new ideas Useful aide memoire
3	Principal Lecturer, Australian University	<ul style="list-style-type: none"> Sophisticated form of brainstorming that helps build a bigger picture
4	Professor, UK university	<ul style="list-style-type: none"> Opportunity for a wide variety of inputs all at once from different people

The reasons given for valuing knowledge cafes include some of the reasons given by experts in the research by Lefika and Mearns (2015) (see **Table 3**).

Phase 2 – Three Knowledge Cafes: International Postgraduates, Higher Education / Industry and London Law Firm

Phase 1 led to further exploration of this subject in different settings. The researcher facilitated three knowledge cafes in different environments between 2010 and 2012 and obtained feedback from some of the participants of each knowledge café, via a questionnaire. Informed consent was obtained from respondents who were asked four likert-scale questions based on feedback from Phase 1. Then, the questionnaire prompted them to give a brief statement of their overall assessment of their knowledge café experience.

The number of participants at the knowledge café always exceeded the number of people who gave feedback. Details of the organisations and numbers of participants and respondents are given above (see **Figure 1** Phase 2) and a summary of feedback is given below (see **Tables 5 and 6**).

Table 5 – Phase 2 Summary of Likert Feedback from Respondents of Three Knowledge Cafes

Organisation Context	Type of Participants /Respondents	Helpful for Exchanging Ideas on an Issue (average likert score: scale 1-4: top score 1 = 'Strongly Agree')	Prefer IT to exchange views rather than face to face knowledge café (average likert score: scale 1-4: top score 1 = 'Strongly Agree')
Higher Education Institution, (27 th Oct 2010) (Knowledge Café 1)	International Business Students	1.6	2.8
Large Law Firm London (8 th Dec 2010) (Knowledge Café 2)	Knowledge administrators, lawyers and managers	1.9	3
Higher Education Institution (17 th July 2012) (Knowledge Café 3)	Range of Professional workers	2.75	3

Table 6 – Phase 2 Summary of Assessment of Knowledge Café Experience from Respondents of Three Knowledge Cafes Compared to Lefika and Mearns (2015) classification of Knowledge Café Advantages (see Table 3)

Identity Number	Summary of Response		
	Language Suggesting Generally Positive or Negative?	Issues of Assessment of Knowledge Café experience	Any similarities with Lefika and Mearns (2015) classification of advantages?
Knowledge Café 1			
1	Positive 'very useful'	<ul style="list-style-type: none"> gives different views on same points can help change your mind 	Not really
2	Positive 'good way of getting people to communicate'	<ul style="list-style-type: none"> good way of getting people to communicate and exchange ideas, questions and thoughts therefore better understanding of topic 	Yes (2 and 8)
3	Generally positive 'useful'	<ul style="list-style-type: none"> could not distinguish it from a simple discussion 	Not really
4	Conditional positive 'depends'	<ul style="list-style-type: none"> depends on what person learns new perspective take something 	8? Possibly
5	Positive 'fascinating'	<ul style="list-style-type: none"> different opinions on topic are fascinating learn from others 	Second bullet [8]

Knowledge Café 2			
1	Positive 'Very valuable'	<ul style="list-style-type: none"> • Stilted conversation later flowed • Themes from it for business use • Valuable conversation with people would not normally talk to 	Third bullet [3]
2	Positive. 'useful'	<ul style="list-style-type: none"> • People can express their issues they have not always related to the specific issue [but still useful] 	2
3	Neutral	<ul style="list-style-type: none"> • Unexpected common themes arose • New issues • Couple of solutions to minor problems 	2 and 6
4	Positive. 'enjoyed it, interesting...'	<ul style="list-style-type: none"> • Interesting to hear others' views • Not sure how to take forward 	First bullet [2]
5	Very positive. 'wonderful' 'I loved this kind of forum'	<ul style="list-style-type: none"> • Passion for sharing needs willing participants • Motivational • Problem-solving 	Third bullet involves 6
6	Neutral / positive. 'Quite interesting' 'Good to...'	<ul style="list-style-type: none"> • Time to discuss issues with knowledge lawyers 	2
7	Positive. 'Good to ...'	<ul style="list-style-type: none"> • Get together without specific agenda 	1 [and possibly 2]
8	Positive. 'useful...'	<ul style="list-style-type: none"> • Discuss in relaxed way 	Arguably 1 and 2
9	Positive. 'useful...'	<ul style="list-style-type: none"> • Talking to people would not normally talk to • No solutions but identified problems 	1 and 2
10	Positive. 'useful...'	<ul style="list-style-type: none"> • Good forum for sharing ideas • Uncertain about practical change 	2
11	Positive	<ul style="list-style-type: none"> • Brought up issues and problems he/she did not think to address ready for action 	2
12	Negative. 'not particularly helpful.'		
13	Positive. 'valuable...'	<ul style="list-style-type: none"> • Valuable to spend time as a group • Interesting potential for brainstorming 	1, 2 and 6
14	Positive. 'useful...'	<ul style="list-style-type: none"> • Useful way of addressing an issue 	First bullet [1 and 2 to some degree]

		<ul style="list-style-type: none"> • Encourages through provoking discussion 	
Knowledge Café 3			
1	Neither 'unable to comment'	<ul style="list-style-type: none"> • Presentation at beginning too vague and unstructured and too long • Dancers were great 'interlude' • Use of technical sound systems 	
2	Positive 'loved the lines..'	<ul style="list-style-type: none"> • Feeling is that more than words needed to make café work • Use of tango and art forms helpful • Metaphors helpful • Wide mix of people excellent • Helpful when people don't think or talk like business textbooks 	Fourth and fifth bullets [1, 2 and 8]

The overall picture from the feedback from respondents in Phase 2 of the research was that the majority of respondents found the face to face knowledge café experience helpful and positive over and above what a participant could experience purely using IT-based communication. The qualitative feedback indicates that there were a lot of reasons why knowledge cafes were a positive experience for most respondents. A number of the reasons given overlap with the advantages classified by Lefika and Mearns (2015) (see **Table 6**). However, a number of other reasons for the positive experiences of participants in knowledge cafes were given too. These included:

- 9 listening to/seeing new viewpoints/perspectives on a topic;
- 10 helping to change a person's mind on a topic;
- 11 identifying themes for business use;
- 12 valuable conversation;
- 13 expressing thoughts on issues that would not be raised /heard otherwise;
- 14 identifying new issues;
- 15 improving motivation;
- 16 enjoying and having time to discuss things;
- 17 'getting together without a specific agenda';
- 18 encouraging people [through discussion];
- 19 realising new questions /issues that may not have been addressed before and;
- 20 enjoying new experiences together.

This research led to a final phase of research focused more on why most participants of knowledge cafes value them in the context of their work/organisation(s).

Phase 3 Knowledge Café of stakeholders in Environment and Rural Affairs in the UK

The researcher chaired the café (see **Figure 1**) and gave out a questionnaire to the participants at the end of the café. An open question was posed on the experience of participants at the knowledge café. There was deliberately no 'leading question' in the questionnaire so that the feedback from the 31 respondents could be compared with previous feedback and arguably

is more powerful evidence to support conclusions against the theme of this paper. For details of the feedback see **Table 7**.

Table 7 Summary of Feedback from Knowledge Café Experience of Stakeholders in Environment and Rural Affairs in the UK

Respondent	Brief Statement assessing Knowledge Café Experience	Was the experience positive?	Reason(s) for Valuing the Knowledge Café (cross reference(s))	Additional Reasons?
1	"I was a little sceptical at first, but the group discussion did provide a useful brain-storming session with useful output."	Yes	6	
2	"Very useful process. Will take the method/tool back to my organisation. Great for identifying common ground and focusing on the main issues."	Yes	12	
3	"Stimulating and enjoyable. A pleasant change from listening passively to presentation."	Yes	20	{21} Mental stimulation
4	"Positive in that sharing of different views [is] good. However, usefulness determined by implementation by [a government organisation] of views"	Yes	2	
5	"Not sure how constructive it was to repeat the question with the movement of groups, but it was generally a good discussion. With the question on the board, could have been the objective/aim of the exercise."	Yes	12	
6	"Good experience! Enjoyed it! Perhaps one more change of people"	Yes		
7	"Wondered off the point somewhat. Interesting concept will use myself...opened up conversation/other ideas etc"	Yes	6	
8	"20 minutes still seemed quick, but better than last time. Got key points across and learnings from others' views in small table discussions."	Yes	8	
9	"it was a productive way of initiating discussion. It sparks my interest on this way of brainstorming and will take it forward to apply in any job."	Yes	6	
10	"I was initially sceptical, but found it more useful than I suspected, and more focused (compared to other similar events). Need to rearrange furniture lost valuable time, but otherwise valuable."	Yes		
11	"the use of more groups was good, however assembling post it notes onto board answers sometimes misses the nuances or [?] of the debate."	Yes		
12	"It was interesting to engage with people, but can't say there was any difference to a standard brainstorming session or discussion."	Yes	6	
13	"I enjoyed the experience"	Yes		
14	"Valuable + open discussion and beneficial to all involved. Good experience overall."	Yes		

15	"Very helpful unhindered and open exchange of views"	Yes	9	
16	"The process is straightforward, but the aim and value of output against any process that relied on the output was unclear."	Neutral		
17	"7 out of 10. Good!"	Yes		
18	"Potentially useful as a technique. But easy to become trapped in smaller groups with specific details."	Yes		
19	"Very interesting and gave the ability through exchange to obtain different viewpoint/output"	Yes	2 and 9	{22} Interesting
20	"Small groups encourage open discussion"	Yes	2	
21	"Interesting Small groups worked well Larger conversation was good at the end – bi"	Yes		22
22	"Very interesting experiences which I'll bear in mind in the future."	Yes		22
23	"Useful and interesting"	Yes		22
24	"In principle the café works. There are always those in [?] into [?] and steer and dominate conversation+ this makes the Café style flow tough."	Yes		
25	"Valuable way of networking across the group and sharing ideas in an open transparent way."	Yes	1 and 2	
26	"Fruitful discussion. Sharing knowledge is always useful but would like to know what outcomes are used for"	Yes	2	
27	"The experience was useful and constructive."	Yes		20
28	"Good opportunity to share thoughts with stakeholders with different/various views."	Yes	2 and 9	
29	"Enjoyed unexpected differences in points brought across @ the different tables. The big "plenary" discussion was most effective."	Yes	2 and 9	
30	"A great leveller/equaliser ensuring equal voice/participation from all present."	Yes		{23} Leveller /equaliser /takes away hierarchy
31	"Went v. well. Constructive discussions + provided a good format to hear different views."	Yes	9	

Notably 30 of the 31 respondents found the knowledge café experience a positive one. The other respondent was neutral. The reasons given for this positive experience concur with those found in the previous phases of the research. Notably, there is a particular emphasis on the value of knowledge sharing, idea generation and seeing different viewpoints (see **Table 7**). Also, four other reasons were given (see **Table 7**).

5. Brief Discussion and Categorisation of Reasons Why Knowledge Cafes are Valued

This research illustrates how participants generally find knowledge cafes a positive experience. Out of a total of a total of 55 respondents, 51 provided positive feedback on their experience without being prompted by the researcher. This research identifies 24 reasons why knowledge cafes were valued by participants. These reasons and the frequency of mention are categorised (by some key verbs). This is illustrated below (see **Table 8**).

Reason Id Number	Reason	Frequency of Mention (from Respondents)	Category	Total for the Category
3	Leadership Training		Changing	3
7	Change Management		Changing	
10	Helping to change a person's mind on a topic	1	Changing	
15	Improving motivation	1	Changing	
18	Encouraging people [through discussion]	1	Changing	
4	Mergers		Changing/Sharing	
1	Connecting People	6	Connecting	6
6	Creating new ideas	5	Creating/Solving	9
24	Problem solving/brainstorming	4	Creating/Solving	
16	Enjoying having time to discuss things	3	Enjoying	9
20	Enjoying (new) experiences together	6	Enjoying	
11	Identifying themes for business use	3	Identifying	
14	Identifying new issues	5	Identifying	9
19	Realising new questions /issues that may not have been addressed before	1	Identifying	
2	Knowledge Sharing	11	Sharing	32
5	Leaders Share Experiences		Sharing	
9	Listening to/seeing new viewpoints/perspectives on a topic	10	Sharing	
12	Valuable conversation	4	Sharing	
13	Expressing thoughts on issues that would not be raised /heard otherwise	3	Sharing	
17	Getting people together	4	Sharing	
8	Learning and Understanding	4	Learning	
21	Mental stimulation	2	Learning	
22	Interesting	7	Other – Interest	7
23	Leveller/equaliser/breaks down hierarchy	1	Other - leveller	1

The most frequently valued aspect of knowledge cafes is the *sharing* aspect and the experience of finding experience '*interesting*' but the other categories of value (*changing*, *connecting*, *creating/solving*, *identifying*, *learning* and *enjoying*) should not be underestimated. With these findings in mind, there are a number of areas in business/organisations where knowledge cafes could be useful, and this set of categories and reasons could be used by an organisation/individuals to justify using the knowledge café technique in different situations.

6. Limitations and Future Areas of Research

The total number of participants in the knowledge cafes facilitated as part of this research exceeded the number of respondents. The total number of participants was 139 and the total number of respondents was 55. At one large Knowledge Café 2 (Phase 2) (see **Figure 1**) I had to canvas feedback by sending out the questionnaire by e-mail because I forgot to give it out

at the end of the café. In the case of the Knowledge Café with 60 participants last year (see **Figure 1**) some participants were still involved in their conversations and so did not give in a feedback sheet in, and although the questionnaire was short the chair of the day-long event wanted to move things on and get to lunch! This may have led to fewer responses than may have otherwise been achieved. There is always scope for more feedback from participants about why they may value knowledge cafes but the evidence from this research is conclusive that most participants *do* value them and for a wide range of reasons.

One future area of research is the effectiveness and comparative value of knowledge cafes conducted using Zoom technology (Gurteen, 2019). Video-conferencing/Zoom technology can bring connection bridging geographical barriers whilst retaining richness of communication (Panteli and Dawson, 2001; Maul *et al.* 2018). However, the dynamics of knowledge cafés conducted using Zoom technology with participants around the world are, to some extent, different, looking at lots of faces on screens and going in to virtual ‘rooms’ with a few participants (Gurteen 2019). It would be interesting to find out whether participants of international knowledge cafes using Zoom technology value the experience more, less or the same as face to face and whether for the same/similar reasons or not. The implications of this for uses in organisations, CoPs and business would also be valuable areas of research to explore.

Conclusion

This paper explores why knowledge cafes can be valuable to organisations. Through a cascade methodology applied over a number of years, virtually all respondents gave feedback that confirmed that they did value knowledge cafes and a wide range of reasons were provided for such a positive response. This paper categorises these reasons with key verbs and these reasons can be used to justify the use of knowledge cafes in different settings in the future. The key verbs/nouns are (in order of frequency of mention) *sharing, creating/solving, enjoying, identifying, interest, connecting, learning, and changing.*

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Knowledge Management in Small and Medium Enterprises (SMEs)

Absorptive Capacity in Highly Dynamic Market: Multiple Case Study on the Behavioral Aspects of Thai IT SMEs

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Abstract: Many past researches have shown that behavioral factors strongly influence knowledge transfer in highly dynamic markets. However, there has yet any studies that focus on the transfer of knowledge in the evolvement of absorptive capacity in firms. Firms such as IT SMEs rely on the absorption of new knowledge to survive. Under such dynamic market condition, these firms require regular update of their organizational knowledge to sustain competitiveness. The lack in research leads us to the question of how behavioral factors impact the absorptive capacity in highly dynamic market. This study uses qualitative exploratory multiple case study. Data were collected from six Thai IT SMEs. A cross analysis was conducted between the current findings and exiting literatures. The findings indicated three significant deviation. Conforming behaviors such as trust or buy-in can be found in both the general and highly dynamic markets. Inconsistent behaviors which include Not-Invented-Here, or Only-Used-Here, do not appear in the highly dynamic context. Emergence behaviors, such as fear-of-speaking, or knowledge hoarding, only appear in the Thai context and not in the general market. Understanding these characteristics in knowledge transfer will enable ease of transfer, effectiveness of transfer and avoidance of misapprehension in the knowledge transfer processes.

Keywords: *Absorptive Capacity, Knowledge Transfer Behaviors, Highly Dynamic Market*

1 Introduction

In the systematic literature review on absorptive capacity by Senivongse, Mariano, and Bennet (2014), it reveals that there are several impacting exploratory regimes when exploring the internal process of absorptive capacity. These regimes comprise of the agent roles that facilitate the flow throughout the process of absorption, the socio-psychological factors that accommodate the knowledge in-flow process, the process and routines of the absorption, and the behavioral aspect of the absorption. Among these regimes, behavioral aspect plays a significant role in the transfer of knowledge across organizations. Knowledge transfer occurs when the transferor and the recipient find the transfer beneficial and useful (Kwok & Gao,

2005). However, there are limited literatures on this aspect and existing studies mainly focused on the influence of behavioral factors to the overall concept of absorptive capacity and less on the internal capability elements of absorptive capacity. This research gap is significant especially in highly dynamic market where knowledge absorption occurs frequently in the organization. This study selects the Information Technology Small and Medium Enterprises (IT SMEs) as the study venue. An explorative multiple case studies is adopted for the study.

The purpose of the study is to define and compare the behavioral context that have impact on absorptive capacity for firms in highly dynamic market. This leads to the first research question (RQ1).

RQ1: What are the behavioral factors on absorptive capacity that co-existed and do not exist in highly dynamic market?

Since behavioral aspects are specifically influenced by cultural norms, there should be some behaviors that emerge and present only in the Thai cultural context. This leads to the second research question (RQ2).

RQ2: What are the specific behaviors that only existed in Thai IT SMEs context?

2 Theoretical background

From the theory of organizational learning, three observations are drawn from behavioral studies; the first behavior is based on routines capability; the second, relates to routine capabilities that are based on past performances; and third, organizations are oriented toward target (Levitt & James , 1988). Organization is learning by associating the past performance into routine capabilities that guides behavior. Thus, behavior govern the routines of knowledge absorption (Fernhaber & Patel, 2012).

Minbaeva, Pedersen, Björkman, Fey, and Park (2003) conducted research on absorptive capacity under the perspective of employee ability and motivation. The study confirmed that both ability and motivation played important roles in facilitating the transfer of knowledge. This aspect agitates the need to explore behavioral factors that impact the development of absorptive capacity.

2.1 Absorptive capacity

Cohen and Levinthal (1989) initially defined and conceptualized a construct that contained capability of a firm to absorb new external knowledge and named it as “absorptive capacity”. Absorptive capacity is the firm’s ability to realize the value of the new emergence of external knowledge, assimilates the knowledge across the organization, and exploits the newly absorbed knowledge to deliver the value that contributes to the firm’s competitive advantage (Cohen & Levinthal, 1989, 1990).

Zahra and George (2002) redefined the construct and suggested that absorptive capacity is a concept comprising of four internal elements of acquisition, assimilation, transformation, and

exploitation. These capabilities which are oriented in sequential manner will allow the firm to gain and sustain competitive advantage. Adding transformation capability into the construct allows absorptive capacity to be treated as dynamic capability. The transformation therefore allows a firm to adjust its resources to undertake the turbulence threat in the market. Transformation allows the firm to change its operation mechanism and adjusts the process to enhance the firm's competitiveness (Raisch & Birkinshaw, 2008; Rothaermel & Alexandre, 2009; Teece, Pisano, & Shuen, 1997). Transformation becomes the key in realizing and combining newly absorbed knowledge into the existing knowledge structure. However, it has been argued whether transformation is a necessary capability element in absorbing knowledge as the firm's in this market segment requires high responsive reaction to the emergence of new knowledge. With existing knowledge trait, firm can leverage its absorbed knowledge instantly without having to adjust its resources before the utilization of the new knowledge.

Todorova and Durisin (2007) proposed an enhancement of the construct by indicating that transformation is a capability in parallel structure which might be needed in moderate and low turbulence markets, while assimilation alone was enough for the high turbulence, highly dynamic, market. These researchers also added a feedback loop to reflect the result of the exploitation in cyclical approach. The new proposed model clustered around the original construct of Cohen and Levinthal (1989). This preservation is significant as the construct does not deviate too much from the original intention (Lane, Koka, & Pathak, 2006). Todorova and Durisin's (2007) conceptualization of absorptive capacity is used as the referring construct in this study. It is the latest conceptualization based on recent evolution from the original ideas of Cohen and Levinthal (1990).

2.2 The positive reinforcement of behavior on knowledge transfer

Absorptive capacity is the organizational level construct (Cohen & Levinthal, 1990; Lane, Salk, & Lyles, 2001; Roberts, 2015). It has two elements. Firstly, the prior level of knowledge traits and secondly, the intensity of effort (Minbaeva et al., 2003; Zahra & George, 2002). The intensity of effort comes from the motivation that employees wish to contribute to the company. Motivation is an important element of organizational behavior in constructing absorptive capacity (Rose-anderssen, Baldwin, Ridgway, Allen, & Varga, 2009). Motivational problems, such as willingness to absorb or share knowledge, can be overcome by socialization, compensation, documentation, toleration, communication, and rotation (Kalling, 2003, p. 117).

2.3 The negative reinforcement of behavioral effect on knowledge transfer

Szulanski (1996) studied on "stickiness" characteristic of knowledge transfer in the organization found that the major barriers to the efficacy of knowledge transfer came from causal ambiguity and the inter-personal relationship between the knowledge transferrers and the recipients. Causal ambiguity results from the lack of knowledge trait to help understand the context of the new knowledge in absorption. Trustworthiness of the transferrer-recipient also impacts on the efficacy of the knowledge transfer. In an untrusted environment, the transfer will be more difficult. This also leads to the behavior of "Not-Invented-Here" (NIH) syndrome that any foreign knowledge is rejected. The rejection results in the restrained

behaviors, such as “foot dragging, feigned acceptance, hidden sabotage, or outright rejection” (p. 31).

Simonin (1999) discussed that causal ambiguity had direct impact on knowledge transfer. His study confirmed that the knowledge aspects of tacitness, cultural distance, and organizational distance causes ambiguity which impact the outcome of the transfer. Tacitness is the deep personal knowledge that is difficult to communicate and share, and it requires inter-personal relations to elevate the transfer (Elwyn, Taubert, & Kowalczyk, 2007; Nonaka & Takeuchi, 1995). Cultural distance is the major difference in the cross-cultural setting. The distance determines the difficulties that impact relationship and understanding between transferrer and recipients when they come from different cultures. For example, the lack of common language causes difficulty in understanding the transferred context. This also include the lack of cross-cultural skills, exposure, and understanding which impair both the ability to learn and applying the knowledge. The organizational distance represents the degree of dissimilarity in practices, norms, values, and organizational cultures (Xu & Ma, 2008).

Psychological safety is a shared belief held by the members of the group which is safe among the members (Edmondson, 1999). It anticipates the belief of how other members will respond when one acts on something, such as asking question, expressing opinion, and sharing idea (Carmeli, Brueller, & Dutton, 2008; Edmondson, 2014). The belief will lead to negative consequences of being embarrassed or criticized. Psychological safety is found to have impact on learning and team performance (Cauwelier, Ribièrè, & Bennet, 2016; Edmondson, 1999; Edmondson, 2014). Learning in team is based on interpersonal relationship among the team members. Trust is treated as the driving mechanism to the construct of the learning climate (Edmondson, 2014).

Psychological safety is influenced by the cultural norms that exist in the country where the individual or team members grew up (Cauwelier et al., 2016). This reflects negative behavioral symptom which appears as fear of expressing oneself in public or fear of using English as communal language for knowledge transfer. Such behaviors are quite common in the Thai enterprises setting.

2.4 IT SMEs and IT SMEs in Thailand

Thailand’s Office of Small and Medium Enterprise Promotion (2007) indicated that IT SMEs in Thailand lacked competitive edge. The lacking was attributed to various reasons such as weak production and management structures, lack of marketing capabilities, low on product and service development, low labor quality, inefficient use of technologies, low access to capital funding, lack of environmental accountability, and lack of networking and collaboration among their peers in business operations. There are hundreds of IT SMEs entering into the market each year (Kim & Mauborgne, 2004). Some of them survived and lived through their years of existences. Some had to close down after a few years in operation. One of the common understanding of the Thai IT SMEs is that they tend to rely on products that are developed by their global partners. Without having products of their own, they systematically became technology brokers.

Being technology brokers, the key value of their business is the provision of fast technological update to their customers. In the highly dynamic market, there are several technological knowledges updated a few times a year for each product (Volberda, 1997). These IT SMEs have to keep learning and updating their knowledge in order to survive and gain competitive advantage over their rivals in order to satisfy their customers. The numerous learning efforts that occurred throughout the years provided the perfect setting for case study to examine the impacts of absorptive capacity on firms in highly dynamic market.

Another key consideration to assess data from this industrial segment is to use the performance of IT SMEs. These indicators can include product differentiation, or marketing related activities. Due to the nature of the industry, products and services offered to them may be widely available from multiple suppliers. The only factor that influences customer in making decision to choose a supplier is customer's preference. Absorptive capacity is the only profound strength that leverages this privilege.

Knowledge transfer in this industry starts from the foreign product owner along its eco system value chain to IT SMEs (Ernst & Kim, 2002), before being re-transferred to the end customers. The transfer involves surpassing several barriers. These barriers determine the efficacy of the absorption. This study focuses on the behavioral factors that facilitate or prohibit the transfer of knowledge in the segment of this industry.

3 Research Methodology

There are two parts in this study. The first part explores the past literatures on absorptive capacity and behavioral aspect during 1989-2015 using systematic literature review approach. The objective of the first part is to define what scholars have mentioned about behaviors that impact absorptive capacity. The analyzed data from this part is used as the foundation to compare with the data collected from the highly dynamic market. The second part used qualitative analytic approach from collected data. The findings reveal specific behaviors that impact absorptive capacity in this specific market.

3.1 Systematic literature review on behavioral aspect of absorptive capacity

Senivongse, Bennet, and Mariano (2017) reviewed 189 absorptive capacity research documents that were published in the past 25 years. The review explored into details following the relevant impact to the internal elements of absorptive capacity. Behavioral aspect is one of the exploratory regimes that govern to explore the characteristics of absorptive capacity (Senivongse et al., 2014). For each of the absorptive capacity element, the behavioral aspect was explored to identify of what scholars had mentioned. The extracted findings are used as the based-line that represents general behaviors that influence absorptive capacity. Table 1 denotes the findings.

Table 1: Literature review of behavioral analysis on Absorptive Capacity

Absorptive Capacity internal capability element	Scholar	Behavioral context
Identification and Acquisition	<ul style="list-style-type: none"> • Sun and Anderson (2010) • Schmidt (2010) • Lane, Salk, and Lyles (2001) 	<ul style="list-style-type: none"> • Intuition and interpretation of individuals and groups • Incentives drive the need for new knowledge • Trust between partners, cultural compatibility, prior knowledge, relatedness of business
Assimilation	<ul style="list-style-type: none"> • Lichtenthaler and Ernst (2009) • Alin, Taylor, and Smeds (2011) • Sun and Anderson (2010) 	<ul style="list-style-type: none"> • Not-Invented-Here (NIH: refusal of foreign knowledge) & Buy-In (strong focus on external knowledge acquisition) syndrome • Common interest across organization • Learning process involves socio-psychological process of interpretation at group-level

3.2 Qualitative approach on behavioral evidences

Data are collected from multiple sources and triangulation are performed to validate the findings (Yin, 2011). Multiple persons from each organization were interviewed to validate the trustworthiness of data. The interpreted results were verified by multiple scholars. In addition to interviewing, observation and revision of documented evidences were performed to cross-check for data integrity.

Six IT SMEs were explored with 34 interviews to all level of personnel from executives, managerial level, and operational level. The six IT SMEs were evenly classified as two Product Distributors (Company A and B), two Value-added Resellers (Company D and M), and two System Integrators (Company C and T) to cover the typical range of services in IT SME industry. The distributors perform the import of products into the country and resell them using partnering channel before reaching the end customers. The value-added resellers are the representors of the product manufacturers who resell products and services to the end customers. The system integrators integrate and combine multiple technologies and customizes them to fit the needs of customers.

To analysis the data, thematic coding was used. Coding categorizes, and contextualized data into themes (Boyatzis, 1998). Recurring behavioral patterns are identified. Table 2 defines the finding and first order codification of the emerging patterns. Table 3 takes the first order codification from table 2 and categorizes them into the second order codification.

Table 2: Data analysis and 1st order codification on behavioral aspect

AC Capability	Evidences	1 st order Codification
Identification and Acquisition	<p>“He [an engineering subordinate] may have fears, or the way I talk is wrong. It might be too strong, making him feels that he cannot speak like me, cannot defend like me so he chooses to be quiet” (MD, M)</p> <p>“For me, I see that learning new things challenges me. Exploring into new things that I have not known before.” (Procurement Officer, T)</p>	<ul style="list-style-type: none"> • Fear of speaking • Challenges as motivator
Assimilation	<p>“I don’t talk to everyone all the time, only the Sales. The communication in the company is always one-way. But after attending the coaching, we are now discussing more in a positive way” (MD, A)</p> <p>“There is no blaming culture. Whole team is responsible. There is no dominating person; the whole team has to go together.” (MD, A)</p> <p>“We appraise them with performance indicators. We give out awards.” (MD, A)</p> <p>“It’s the habit of Thai persons when they are with a small, familiar, group they tend to be more open. But when they are in the larger discussion group, they seem to hold back and become silent” and “Thai people are not like Americans. Americans, when they are in doubt, they fire questions right away. For the nature of a Thai person, even when they are in doubt, they will not ask. I’m not sure if they are shy or do not want to lose face” (MD, B)</p> <p>“My father taught me three things—Goodwill, Punctuality, and Integrity. These three words are the foundations that build everyone in this company.” (MD, B)</p> <p>“What I have done to share knowledge with the customer is my pure passion that I have toward my customer” (MD, D)</p> <p>“There is fear of using English in questioning. The instructor should be aware of this. He should ask questions back to confirm the understanding” (Presales Manager, T)</p>	<ul style="list-style-type: none"> • Use common language • Trust from customer • Trust from management • No blaming culture • Staff motivation by monetary incentive • Fear of asking question • Passion to learn
Transformation	<p>“I had introduced the coaching class to my staff. The outcome of the training is to create a shared vision to ensure their employees know where the company is heading, and they put this into practice so the employees can follow.” (MD, A)</p> <p>“We have the attitude to be a contributor, rather than a taker. Since we are exposed to learning environment at all time, we continuously upgrade ourselves” (MD, B)</p> <p>“With loosely formed alliances designed to serve customer needs, everyone on the team must have a high discipline in self-learning.” (MD, D)</p> <p>“The way I motivate my subordinates is to create the crave of learning. I will tell them where we are heading. I challenge them that learning the new thing would let them be the only team in Thailand to know about this new stuff.” (Presales Engineer, T)</p>	<ul style="list-style-type: none"> • Build shared vision • Attitude of service mind • Attitude of continuous learning • Self-learning discipline • Challenge as motivator • Recognition of being a part of successful team

(Continued)

Table 2 (Continued): Data analysis and 1st order codification on behavioral aspect

Exploitation	<p>“When you are talking to your customers, there is certain information that is by the Marketing.” (Sales Manager, A)</p> <p>“There is no KPI, there will never be. We use a result-oriented approach to get things done.” (MD, C)</p> <p>“Using a monetary incentive as a performance measuring index must be transparent and fair. It must not be based on feeling, but a clear and agreeable judgment” (HR, T)</p> <p>“The managing director does not speak directly. If his subordinates do not inform him, he would assume there was no problem.” (Administrator Manager, T)</p>	<ul style="list-style-type: none"> • Sharing culture • KPI result in stress and turnover • Incentive has 2 sides • Insincere Feedback damages trust • Not share culture
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Table 3: Analysis and 2nd order coding on behavioral factors

1 st order coding	2 nd order coding	Reinforcement
<ul style="list-style-type: none"> • Trust from customer • Trust from management • Recognition of being a part of successful team • Insincere feedback damage trust 	Trust Relationship	Positive
<ul style="list-style-type: none"> • No blaming culture • Recognition • Build shared vision • Leadership 	Building of Trust Relationship	
<ul style="list-style-type: none"> • Attitude of Service mind • Attitude of continuous learning • Passion to learn • Self-learning discipline • Challenge as motivator • Sharing culture 	Learning Mindset	
<ul style="list-style-type: none"> • Staff motivation by monetary incentive • Incentive has 2 sides 	Incentive	Neutral
<ul style="list-style-type: none"> • Not share culture 	Knowledge Hoarding	Negative
<ul style="list-style-type: none"> • Fear of speaking or asking question in public • Language barrier 	Psychological Safety	
<ul style="list-style-type: none"> • KPI results in Stress and Turnover 	KPI as Demotivator	

4 Findings

From qualitative analysis, the study focused on the exploration of behavioral aspect on the internal capability elements of absorptive capacity. From the collected data of the six IT SMEs, the emergence of behavioral factors consists of positive, neutral, and negative reinforcements for the development of absorptive capacity. The positive reinforcement is the factor that influences the increase of the firm’s absorptive capacity. The neutral shows the inconclusive measure if the factor is to support or deteriorate the development of absorptive capacity. The negative reinforcement has negative influence of the development of absorptive capacity.

4.1 Positive reinforcement

The positive reinforcement from this study consists of 'trust relationship', 'building of trust relationship', and 'learning mindset'. Trust is the socio-psychological behavior (Sun & Anderson, 2010) that eases the transfer of knowledge across the organizational transfer network. Trust relationship concerns both external customers and internal customers, such as the management. Trust from customers allows the positive exploitation of the absorbed knowledge. Trust from the supplier encourages the transfer of knowledge from outside of organization across the organizational boundary into the receiving team. Trust from management gains empowerment and agility to react to the new knowledge, which increase the flexibility of the knowledge transfer. Trust from peers gains recognition and enhances the efficacy of knowledge assimilation.

Building of trust is the process that ensures the trusted relationship is properly developed (Roxas, 2008). From the study, trust is built through the process of coaching and mentoring program. The objective of the program is to develop a 'No blaming culture', which allows the sharing of knowledge to happen without any fear of this being taken as a wrong decision or an act of stupidity. The process to build this trusting culture is through the shared vision of where the new knowledge will bring the company and the benefits the company and individuals will realize. The establishment of recognition among peers in a peer culture helps the individuals feel that they are important members of the delivering team. The leader of the team must also lead and act to ensure that team members are on board to deliver something important.

Learning mindset has a direct impact on absorptive capacity. From the study, the learning mindset is developed through the act of top executives as the role model, encouraging other subordinates to follow. The attitudes toward the learning mindset that emerge from the cases are service-minded attitude, continuous learning attitude, passion-to-learning attitude, self-initiated to learning attitude, thriving to be in business attitude, and learning as a challenge attitude. The service minded attitude will equip each individual to empathize with others that needs help, as if he/she is facing the difficulty himself/herself. This attitude will encourage an individual to look for ways to solve the problem. The continuous learning mindset will encourage an individual to keep looking for ways of improvement. The passion to learning mind will give an individual the craving to look for new knowledge. The self-initiated to learning mind creates the discipline of learning and allows the learning to happen anywhere, anytime, and under any circumstances. The thriving to be in business mindset will guide each individual to realize that the business will be in trouble if he does not learn new things. Seeing learning as a challenge will give an individual a boost to overcome difficulty in obtaining knowledge.

4.2 Neutral reinforcement

The use of monetary reward exists in several cases in this study. It was intended to be a tool to motivate staff to absorb knowledge. Some use it to reward the team performance. Monetary reward can be seen as the negative influence when the team is underachieving the target. In this case, the reward is seen as the demotivator, especially when other useful resources necessary for absorption are not properly allocated.

4.3 Negative reinforcement

Negative reinforcement has a reverse impact on the efficacy of knowledge absorption. There are three factors in this negative category: knowledge hoarding, psychological safety, and KPI. The hoarding of knowledge results in not fully transferring knowledge from one team to another. When this happens, the company will have trouble in coordinating the work, and will end up by having the knowledge originating team held responsible for customer support throughout the entire project phases. The company also possesses the risk of losing knowledge when some employees leave the company.

The second negative reinforcement is the fear of psychological safety. It is quite common for the Thai members of these companies to not to speak out, not to ask questions, and not to provide comment or give feedback during the transfer of knowledge. This comes from the non-fluency in using other languages as a means to communicate during the transfer. Language becomes the barrier in term of expressing feedbacks. The size of the transfer group also has an impact on the fear to provide feedbacks. The Thai IT SMEs also has a fear of asking questions or providing comments when the transfer group is large. If the transfer occurs in a small group, especially with the same knowledge discipline, providing of feedbacks occurs freely.

5 Discussion

Table 4 summarizes and compares the behavioral factors that are mentioned in the studies by many scholars and what actually appeared in the study.

Table 4: Comparison of behavioral factors between the reviewed from literature and the actual emergence

Behavioral Factors extrapolated from Literature Review	References	Emerged in this research study	
		Yes	No
Intuition	Sun and Anderson (2010)		X
Incentives that drive for absorption	Schmidt (2010)	X	
Trust	Lane, Salk, and Lyles (2001)	X	
Not-invented-here (NIH syndrome)	Lichtenthaler and Ernst (2009)		X
Buy-in	Lichtenthaler and Ernst (2009)	X	
Common interest across organization	Alin, Taylor, and Smeds (2011)	X	
Group-level socio-psychological interpretation	Sun and Anderson (2010)	X	
All-stored here syndrome (Knowledge generated internally is to be used inside the firm)	Lichtenthaler and Ernst (2006)		X
Related-out syndrome (Strong reliance on external in-sourcing, omit building own capabilities)	Sun and Anderson (2010)	X	

(Continued)

Table 4 (Continued): Comparison of behavioral factors between the reviewed from literature and the actual emergence

Managerial encouragement to share knowledge	Sun and Anderson (2010)	X	
Only-used-here syndrome (Incomplete or underutilization of existing knowledge due to fear of strengthening competitors)	Lichtenthaler and Ernst (2006)		X
Sell-out syndrome (overvaluation of external exploitation potential and undervaluation of consequences for internal knowledge exploitation)	Lichtenthaler and Ernst (2006)		X
Behavior output controls	Li, Lee, Li, and Liu (2010)	X	
Reward and recognition	Sun and Anderson (2010)	X	

The behavioral factors that do not appear in this study are: intuition, not-invented-here syndrome, all-stored-here syndrome, only-used-here syndrome, and sell-out syndrome.

Intuition (Bennet & Bennet, 2008; Crossan, Lane, & White, 1999; Sun & Anderson, 2010) does not involve the identification and acquisition capability. For IT SMEs, poor decision-making means capital expenditure. The selection is to be done carefully. Intuition, heavily dependent on the knowledge and past experiences of the decision-maker. This always comes with uncertainty and prediction for market responses. Using intuition does not allow any mistakes. Thus, the decision-making based on intuition did not surface.

The not-invented-here (NIH) syndrome leads to resistance in the acceptance of knowledge from the outside (Katz & Allen, 1982; Szulanski, 1996). NIH could happen with the group whose members possessed a monopoly of knowledge in the area of specialization, enough not to consider the possibilities that outsiders may produce new ideas or knowledge relevant to the group (Katz & Allen, 1982). In this study, the NIH syndrome does not appear. This is because IT SMEs do not have their own R&D. They rely on knowledge from external sources. In this environment, NIH is not a behavioral factor that has impact on the industry.

NIH syndrome is the diametrical opposition of the Buy-in syndrome (Lichtenthaler & Ernst, 2006). NIH totally depends on internal knowledge, while Buy-in focuses on external knowledge only. For IT SMEs, the NIH syndrome has negative impact and the Buy-in syndrome compliments the positive impact on knowledge absorption.

All-stored-here syndrome has negative impact on the knowledge assimilation process. The new knowledge that is acquired and integrated with existing knowledge is used by the firm for internal purposes only (Lichtenthaler & Ernst, 2006). For IT SMEs, the absorbed knowledge will be combined with the existing trait of knowledge. The combined knowledge could exploit for the firm's advantage.

The same reason applies to the Only-used-here syndrome and the Sell-out syndrome. This is because all combined and developed knowledge are to be fully utilized. Only-used-here syndrome is the behavior that are caused by over-evaluation of external exploitation potentials (Lichtenthaler & Ernst, 2006). The Sell-out syndrome is the behavior that is evolved from the under-evaluation of consequences for internal network exploitation (Lichtenthaler & Ernst, 2006). Over-evaluation and under-evaluation result in costs and mis-appreciation on

return which will severely impact the financial status of IT SMEs. Careful consideration in the identification and acquisition of external knowledge must be thoroughly examined.

Additional behavioral factors that emerged from the analysis of data and that complemented the positive reinforcement of knowledge absorption is the trust (Lane et al., 2001), together with negative reinforcements such as knowledge hoarding (Elwyn et al., 2007) and psychological safety (Cauwelier et al., 2016). These additional behavioral factors manifest in the Thai context. Negative reinforcements can be overcome by knowledge enhancing activities such as the building of trust relationships and the development of a learning mindset.

According to Lane, Salk, and Lyles (2001), the transfer of knowledge between two parties requires active engagement of the transferrer and the recipient, as well as the supportive cultural and cognitive preconditions. Trust is a critical part of knowledge transfer because it helps the knowledge recipient to understand the knowledge the transferrer is offering. Trust has two dimensions that are relevant to transferring and learning. First, it is the willingness to risk vulnerability, which requires openness and sharing of valuable secret (Inkpen & Beamish, 1997). Second, is the confidence that the transferred knowledge will impact the adoption and taking of actions over the new transferred knowledge (Barney & Hansen, 1994). “The greater the trust in the relationship, the more willing all parties will be to share and exchange information” (Lane et al., 2001, p. 1141). Trust also helps lower the costs and the need to monitor behavior when the transferred knowledge is being implemented (Edmondson, 2014). Trust is considered a relational capital (Lichtenthaler, 2008) or social capital (Macpherson & Holt, 2007). It is a socio-psychological learning factors that involves changes in cognition and behavior (Sun & Anderson, 2010). From this study, trust is found to have important influence on the efficacy of the knowledge transfer. Companies in the case studies allocate time and cost for their employees to build trust between their supporting suppliers and partners, as well as their customers.

Knowledge hoarding occurs when the source of knowledge (the transferrer) does not wish to transfer the knowledge to the recipient. According to Szulanski (1996), the two characteristics that could lead to knowledge stickiness were—(1) the transferrer lacked of motivation to transfer knowledge, and (2) the transferrer was not perceived as reliable. For the first characteristic, the lack of motivation comes from the fact that the source might be reluctant to transfer the knowledge. The transferrer fears that the transferred knowledge would result in losing ownership which in turns cause the lost of the privilege position or superiority. For the second characteristic, the transferrer was perceived as unreliable, resulting in the lack of trustworthiness. This makes the initiation of the transfer difficult. When one of the two characteristics was present, knowledge hoarding might result (Koskinen, 2012). From the case study analysis, it was found that knowledge hoarding existed, especially in those firms that required extensive knowledge transfer from one team to another. The higher the number of inter-disciplinary knowledge transfer, the higher the likelihood of knowledge hoarding. To overcome knowledge hoarding, efficient practices of knowledge management is required (Elwyn et al., 2007).

Psychological safety is another behavioral factor that emerged in all cases. There are strong evidences indicating the presence of fear. These fears come from the concern of potentially

humiliating oneself in public. Individuals are afraid of asking stupid questions, of using incorrect grammar, or of using inappropriate words when communicating in English. The fear of losing face dominates their actions and prevents these individuals from taking actions. The simplest way to overcome these fears is to use gatekeeper as the language translator when communicating for knowledge transfer. The size of the learning group can be kept small. Segregating transfer recipients and arranging them into transfer groups comprising the same knowledge discipline helps to overcome fear as well.

6 Conclusion

The purpose of this study is to explore the behavioral dimensions that impact the development of firm's absorptive capacity. The study looks into the internal capability elements of absorptive capacity and explores the behavioral factors that influence each element. Behaviors that are found to exist from the study are compared with the behaviors that are discussed by many scholars from the literature review. There are some factors that co-exist, some do not exist, and some surfaced only in the study.

The co-exist behaviors are common behaviors found in any business environment when developing absorptive capacity in firm.

The non-existence behaviors are the specific behaviors that only existed in high dynamic market, such as IT SMEs. This answers the RQ1, led to the following proposition.

P1: In highly dynamic market, these behaviors have no significant to the development of firm's absorptive capacity. These are intuition, not-invented-here syndrome, all-stored-here syndrome, only-used-here syndrome, and sell-out syndrome.

The behaviors that only existed in this study but not exist in the review of literature of behaviors belong to specific local culture. This gives the perspective of Thai IT SME culture and provides answer to the RQ2, which leads to the following proposition.

P2: In Thai IT SMEs, psychological safety strongly prevails and impacts the development of absorptive capacity. These behaviors are the fear of communicating in foreign language, the fear of asking questions and providing feedback in front of large crowd, and fear of losing face by asking stupid questions or act of stupidity.

6.1 Business implication

The study on the impact of behaviors to the development of absorptive capacity in highly dynamic markets revealed the guidelines for IT SMEs. First, the trust relationship is crucial to successful building of firm's absorptive capacity. Firm should focus on the process to the development of trust relationship.

Second, learning mindset is the core competitive behavior that leads the firm in highly dynamic markets to adopt to the turbulence of changes. Firm should consider implementing and embedding the learning mindset into the company culture.

Third, reward as incentive can be applied to improve the efficacy of absorptive capacity development. However, price incentive may also reveal the negative impact when the target-orientation is used as the evaluation criteria as awarding involves comparison with others.

Fourth, there are negative influencers that deteriorate the efficacy in the development of absorptive capacity. These factors include the local fear factors that are stemmed from the psychological safety, such as fear of using foreign language in communication, fear of asking question, fear of providing feedback, fear of expressing ideas in front of large crowd and fear of losing face from acting with stupidity.

Last, Knowledge hoarding may also exist when knowledge transfer involves the cross-boundary of inter-disciplinary network. Knowledge hoarding may be overcome by the implementing of knowledge management practices.

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Knowledge Management in SMEs: Theory or Practice – Paradigm or Experience

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Abstract: According to a dictionary definition, ‘paradigm’ means “the accepted way of viewing reality in a given field, doctrine, etc.”. The word comes from Greek παράδειγμα (*parádeigma*) and literally means “pattern, example”. The definition of ‘paradigm’ devised by the philosopher Thomas Kuhn in 1962 describes it as a collection of concepts and theories that form the basis of a given science. Knowledge management, on the other hand, is a complex process, which includes: (1) management of employees’ intellectual potential, (2) management of knowledge resources, and (3) IT support for knowledge management. In a knowledge-based economy, knowledge is a strategic resource – both for individuals and enterprises – as it determines development and economic growth owing to processes of acquiring, accumulating and processing of information. Can the problem of ‘knowledge management’ be, therefore, treated as paradigm, or is it an economic concept, or, rather, the resultant of experiences, which, by definition, are practical, and not theoretical, in nature? The article aims to analyse the perception of this issue – the relationship between theory and practice – among small and medium-sized enterprises operating in today’s volatile market environment.

Keywords: knowledge management, SME, small and medium-sized enterprises, intellectual capital, business information

Introduction

The issue of knowledge goes back to Aristotle and Plato, whose theories are the foundations of two main currents in epistemology, although certain reflections on this topic can already be found in the Ionian school, in the theories of Miletus philosophers: Parmenides – an advocate of reason and rationality, and Heraclitus – a proponent of ‘panta rhei’ and sensual perception. According to an encyclopaedic definition, on the other hand, knowledge is “the totality of reliable information about reality and the ability to use it”. Therefore, knowledge management becomes an interdisciplinary and complex issue, with so-called knowledge hierarchy model. It assumes the coexistence of (1) data – raw facts and numbers, (2) information – processed data, which can be collected and processed via various electronic media, and (3) knowledge, which is a human domain and involves interpreting cause-effect relationships (Probst, Raub & Romhardt, 2002, p. 35). The top element in this hierarchy is wisdom, which is the maximum level of knowledge, and which may also exist in the context of a particular organisation, taking into account the specific nature of its activity. Wisdom would, in that case, mean the ability to put the knowledge resources at hand into practical use. Knowledge based on data and information is, after all, a much broader concept, closely related to a person or organisation acting as its administrator. It is also an interlinked item, because the two basic links of the model, data and information, may be present on their own, in the

form of independent sets, databases or documentation, and be stored in a computer or other electronic devices, but knowledge – which assumed the necessity of a human element – is not. It is a combination of both rationalism: the obtained data and information, that is hard records, and empiricism: the experience, intuition and understanding of its owner who stores it in their own mind.

Knowledge in organisations is usually present in the form of documentation, procedures, processes, practices or applicable standards. The most common classification in the literature on the subject divides knowledge into: (1) explicit knowledge, and (2) tacit knowledge, or, in other words, public and private (Nonaka & Takeuchi, 1995).

Explicit knowledge is organised and systematised – through signs, words, symbols or numbers – with an easily articulated set of processed data and information. It is stored in the form of (usually) public reports, and also constitutes the content of manuals or patents. It is normalised and systematic, which makes it easy to store, process and transmit via computers and other new technologies.

Tacit knowledge, on the other hand, is hidden in human minds. Hence, it is individual in nature, which prevents its formalisation, mass processing and distribution. Its components include intuition, the culture of an organisation which creates individual experiences, ideals, values, priorities, as well as the emotions of individuals. Assuming that in a knowledge-based economy it is the basic resource of an organisation, it should be perceived as the sum of intellectual assets of each employee, team and department which make up the organisation. Further complexity is added to the problem by the fact that the holder of such knowledge is often unaware of its value and the possibilities of using it, hence its formalisation and transmission becomes all the more difficult and limited.

According to A. Toffler, knowledge has four basic attributes:

- (1) dominance – it is the key resource of strategic importance,
- (2) inexhaustibility – its use does not deplete the resources, on the contrary, it adds further value,
- (3) simultaneity – it can be used at the same time by different people in different places in the organisation,
- (4) non-linearity – the amount of the resources possessed does not determine the possible effects (Toffler, 1980).

Therefore, its unique character has a decisive impact on the creation of exceptional values which enterprises, in the very competitive economic environment, can use to find their identity to distinguish themselves from others (Małecka, 2018, pp. 485-493).

1 Models of knowledge

Literature on the subject shows attempts to observe practices related to knowledge management and to systematise them, for purposes of efficiency, thus enabling the creation of certain patterns of organisational behaviour. There are, indeed, certain models for generating knowledge in an organisation:

- (1) The Japanese model, also known as the theory of organisational knowledge creation, which considers the role of explicit knowledge as insufficient – being only a small part of knowledge available in organisations. An important element of this model is processing – conversion of tacit knowledge into explicit knowledge through a continuous process. The model was developed by two Japanese men, Nonaka and Takeuchi, in the early 90s in the form of a ‘knowledge spiral’. Explicit knowledge is, according to this model, part of tacit knowledge

that can be systematised so that it is transferable. An important element is the repetitive cycle between the two types of knowledge, consisting of four knowledge conversion processes:

- socialization, or the conversion of tacit knowledge into tacit knowledge,
- externalization, or the conversion of tacit knowledge into explicit knowledge,
- combination, or the conversion of explicit knowledge into explicit knowledge,
- internalisation, or the conversion of explicit knowledge into tacit knowledge (Nonaka & Takeuchi, 1995).

(2) The resource model, in which knowledge is treated as a strategic resource and a source of competitive advantage, the precursor of which is D. Leonard-Barton from Harvard Business School. The basis of this model are core competences and core capabilities which concern both internal conditions and the business environment, embedded in the present and in the future, clustered around key skills of all employees and in each area of the organisation's activity:

- common problem solving,
- experimenting,
- implementation and integration of new tools and technologies,
- importing of knowledge (Leonard-Barton, 1995).

(3) The process model, in which the process of creating knowledge is of utmost importance to an organisation, has been devised by P. Murray and A. Myers and assumes that a knowledge management process is the totality of the processes of creating, disseminating and using knowledge to achieve the organisation's goals through a three-stage learning process:

- knowledge acquisition (creating and developing of new qualifications, technologies, and methods, or purchasing them from outside, acquiring of specialists and experts),
- knowledge dissemination (locating of knowledge in the organisation, sharing it and replicating ready-made solutions),
- use of knowledge (integration of learning and application in new conditions) (Murray & Myers, 1997, pp. 31-33).

There are numerous publications by proponents of the process approach, such as T. Davenport and L. Prusak, who also distinguish three stages:

- knowledge expansion,
- knowledge codification,
- knowledge transfer (Davenport & Prusak, 1998; Davenport, 1997; see also Davenport, De Lond & Beers, 1998).

The theory proposed by W.R. Bukowitz and R.L. Williams is also worth mentioning. It suggests a five-stage model:

- knowledge acquisition from the environment,
- use of knowledge in the organisation,
- estimation of knowledge assets in the organisation,
- maintenance of knowledge assets,
 - sale of knowledge in the form of new products, services or technologies (Bukowitz & Williams, 1999).

Furthermore, G. Probst, S. Raub and K. Romhardt distinguished six stages in their process model as being key to knowledge management:

- knowledge location,
- knowledge acquisition,

- knowledge development,
- knowledge sharing and dissemination,
- use of knowledge ,
- knowledge retention (Probst, Raub & Romhardt, 2002).

It is important to note that each model can be implemented in enterprises at the same time, which, depending on the specific nature of the industry, the area and scope of the company's operations, and, in particular, its size, may generate much higher efficiency. The positions presented above have led to the creation of a diagram representing the shared features of all the models described, being key components of a mixed model of knowledge management (Figure 1).

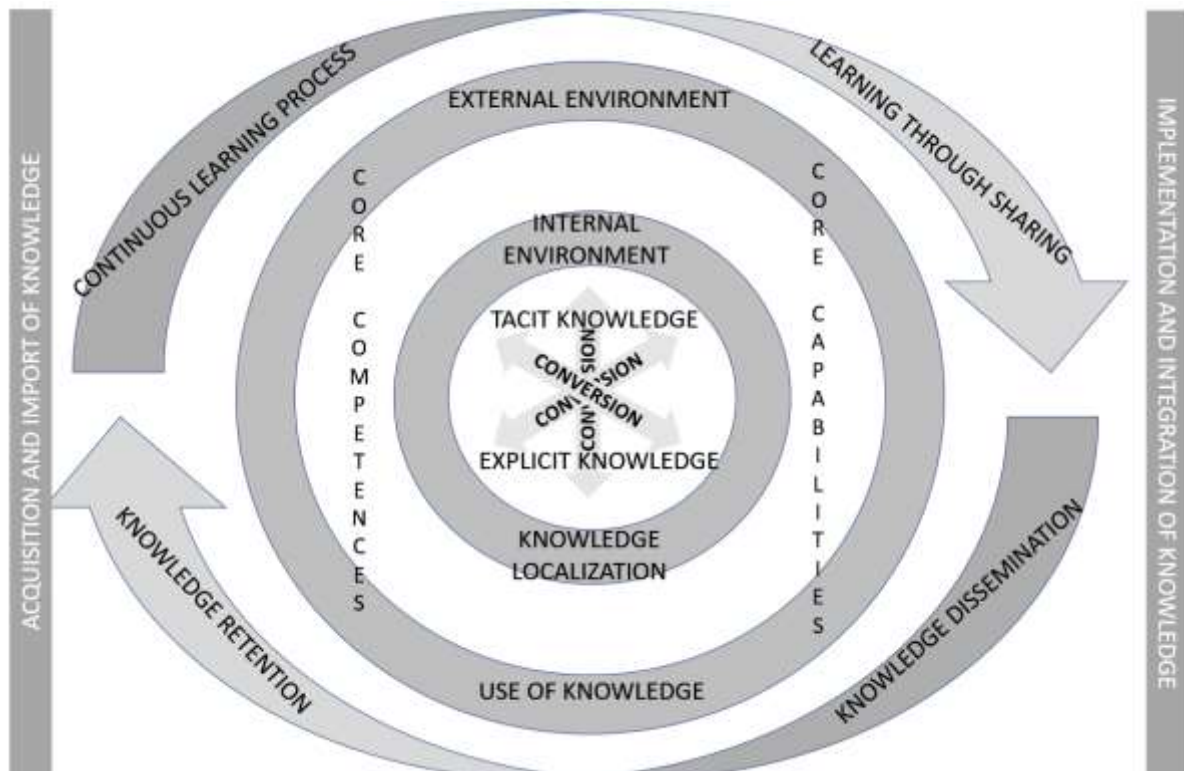


Figure 1. Mixed model of knowledge management

Source: Own materials

Organisations which continue to learn, by skilfully combining the experience of their employees and external cues, implement new processes and projects at a much speedier rate, thus both maximising and benefiting from the intellectual potential of their resources. To create such an environment, trust is required – both in the general human sense and in relation to collecting whole sets of knowledge to be processed – in each aspect of business activity. Knowledge management is not only one of the implementable and practicable suggestions of how to solve problems in enterprises, but it primarily is an open-minded way of thinking, arriving at constructive conclusions from one's experiences and managing the intellectual potential of human resources. In their development, small and medium-sized enterprises face many obstacles. They have, for example, always faced credit discrimination, defined by J.K. Galbraith in 1957, which significantly affects their ability to grow and operate on a global scale, especially when it comes to tools which support their management and failure to see the intellectual potential of their employees (Łuczka & Małecka, 2017, pp. 317-387; Małecka, 2015, pp. 1-122; ; Galbraith, 1983, pp. 63-77; Galbraith, 1957, pp. 124-133).

2 Management strategies in SMEs

Every organisation – regardless of its size or profile of activity – is different. This is due, in particular, to having different resources, operating in different areas and economic environment, and, above all, satisfying different needs and pursuing other goals. The literature on the subject assumes that any organised activity should serve four basic functions:

- (1) provide direction for action to all participants in the organisation,
- (2) enable and facilitate planning and coordination in the organisation,
- (3) enable focusing the attention of employees from all levels of the organisation on its main goal of activity by indicating a certain pattern of behaviour,
- (4) formulate standards for measuring performance on the basis of goals.

Therefore, goals should be clearly and precisely stated, they should be specific and moderate in difficulty, should be measurable, and should motivate and support work efficiency, effectively assisting the management process (Petit, 1975).

As for the management process itself, it should be noted that it is an activity whose subject is always a person, or a team of people, and the object is a person, or a team of people, and the things that they use in the course of deciding on the type and size of goals. Therefore, organisation management can be analysed on two levels: functional and procedural.

The functional approach addresses the interaction of management functions – activities that ensure the achievement of the organisation's goals. The first classification, which consists of five functions, was developed by H. Fayol (1916), who distinguished: (1) anticipating – analysis of the future and making determinations regarding appropriate action plans, (2) organising – taking into account the material and the social organism, (3) ordering – causing “the personnel to function”, (4) coordinating – combining and, simultaneously, harmonising all activities and efforts in the enterprise, (5) controlling – ensuring correctness and compliance with established regulations and issuing orders (Fayol, 1916; Teslar, 1972, pp. 284-314). As those concepts evolved, the current form of this approach has emerged, composed of four functions of management, which is defined as formulating the goal of action and the manner of its implementation by coordinating and motivating:

- (1) planning – setting goals and deciding on the directions of organisational activities, and defining strategies and plans to support their achievement,
- (2) organising – activities aimed at integrating team activities and organising individual work stations, so that the goals set by the organisation can be worked towards and achieved as part of the work process owing to the coordination of tasks,
- (3) motivating – promoting an approach among the team which will enable them to implement the tasks and goals set by the organisation – both for individuals and for the team,
- (4) controlling – making temporal comparisons of the state achieved with that desired.

The process approach describes information/decision feedback between the managing entity and the object of management, with three levels of organisation: (1) low-level, (2) mid-level, and (3) high-level, represented by three subgroups of managers with specific roles: interpersonal, (2) information, and (3) decision-making (Stoner, Freema & Gilbert, 2000, p. 31; Mintzberg, 1983; Mintzberg, 1973; see also: Mintzberg et al., 2003; Mintzberg, Quinn & Ghoshal, 1998). From this point of view, the dependencies that exist between management functions are important, where:

- (1) as the management level goes up, the importance of the control functions decreases, and the importance of planning functions increases,
- (2) as the management level goes up, the role of technical skills decreases and the role of conceptual skills increases.

Planning is the most important management function. In order to be able to organise, control and motivate employees, it first needs to be determined what, by whom, when and where has to be done through main and auxiliary objectives, hence the literature on the subject often refers to planning as the primary management function. Its essence is the development of the organisation's response to changes taking place in the economic environment and to accurately identify future directions of development, while taking into account the organisation's capabilities and resources. Special attention should be paid here to the fundamentals of the knowledge-based management theory, which involves a division into four categories: (1) know-what – knowledge of facts and specific data that can be expressed in words and numbers, stored and transmitted; it is synonymous with information; (2) know-why – knowledge of the laws, principles, and cause-and-effect relationships occurring in nature, the human mind, and the society; (3) know-how – knowledge of skills and experiences which are the basis for practical operation, expressing itself through the qualifications and skills possessed; (4) know-who – knowledge of who knows what and to what extent they specialise in it.

One of the most important elements which permits organisations to achieve their goals is their structure and organisational form, ensuring an internal flow of information and enabling employees to gain correct understanding of and verify their tasks. Conflicts in enterprises usually arise at the interface of internal departments, however, they are also frequently found across both vertical and horizontal structures. Contemporary models of learning organisations are based on coordination and horizontal structures which enable demonstration of engagement and impact on business management. H. Mintzberg has identified five organisational forms:

- (1) Simple Structure – informal ties are dominant, management power lies in a single person's hands (owner, general manager), there is lack of formalisation, flat hierarchy, quick reaction to changes and flexibility of decisions; the success of the organisation depends on the competences of one man;
- (2) Machine Bureaucracy – functions in a steady environment, is characterised by a high degree of work stability, decision-making powers depend on the hierarchy in the organisation, its formalised nature limits the autonomy of members in the organisation;
- (3) Professional Bureaucracy – members of the organisation have very high qualifications, it is formalised and imposes organisational behaviour (hospitals, universities, libraries, consulting companies);
- (4) Divisionalized Form – many independent units are responsible for the entire manufacturing process, operational management belongs to middle management, there is a risk of duplication of functions in the organisation;
- (5) Adhocracy – informal, organic structure in which specialists work in teams as part of specific projects, and structures adopt changes and innovations quickly (Mintzberg, 1983; Mintzberg, 1973).

In the context of conducting research on SMEs, it should be noted that the first and the fifth model are organizational forms which most accurately reflect their structure in market economies. SMEs dominate today's global economy. They account for more than 99% of all businesses in the market and have direct influence on key macroeconomic indicators,

such as GDP or the number of people they employ (in Poland: 50% and 75% respectively). Therefore, the knowledge management competence among those who manage three-quarters of all Polish population capable of work should be an especially weighty and economically justified subject. Although they are smart and agile, showing flexibility and ability to react in flat management structures despite the shortages they face virtually every step of the way and the limited access to capital, it is their fundamental strategy, “first and foremost – survive”, that determines the behaviours and models of operation of enterprises of this size, thus affecting the strategies they employ. Managing a knowledge-based organisation is, however, a distinctive feature because it makes the enterprise unique, which, in a world of striving for continuous improvement of quality, becomes an added value given of any business. The activities of SMEs are primarily accompanied by seven strategies, which can be further diversified for micro and small enterprises, on the one hand, and for medium-sized enterprises, on the other, where management begins to adopt models similar to those found in large enterprises. The order in which they are listed reflects how frequently they are used (figure 2):

- (1) specialisation, or entering a niche: a) market niche – e.g. a single type of customer, b) product niche – e.g. product versions with extra features, custom-made products, or a single distribution channel, or c) geographical niche – e.g. presence in a single region;
- (2) cooperation – non-contractual, contractual, coordinated, e.g. shared information platforms, loose concentration, e.g. appointment of a single representative, compact concentration – formation of business associations;
- (3) gradual diversification – switching to other markets/products/industries;
- (4) differentiation – requires constant innovative activities, enables production of limited series and attracting the consumer with customised goods and services (e.g. being the first business on the market recognisable in a certain area, appropriating attributes such as reliability, referring to tradition, being based on specialisation);
- (5) evasion – avoiding confrontation by finding market segments with low market attractiveness or building a unique image in the eyes of customers;



Figure 2. SME management strategies

Source: Own materials

- (6) confrontation – conducive to innovative, bold activities that promote dynamic development;

(7) leading cost position – seeking markets in which cost minimisation maximises margins (not applicable to the luxury goods market) and acting fast to exploit perceived market opportunities.

An important aspect – from the point of view of management strategies for micro, small and medium-sized enterprises – are the characteristic features of management in enterprises of this size, models of which differ significantly between the smallest enterprises (with 0 to 9 employees), small enterprises (with 10 to 49 employees), and medium-sized enterprises (with 50 to 249 employees) (Table 1).

Table 1 . Characteristic features of management in SMEs

FEATURE	SIZE OF ENTERPRISE		
	MICRO	SMALL	MEDIUM-SIZED
Strategy statement	“First and foremost – survive”	Intuitive	Procedures
Form of strategy	Informal, imprecise	Informal, imprecise	Strategic plan is more often in place
Use of strategic analysis techniques	None, frequent referencing to the environment	None, strategy based on experience	Typical qualitative techniques, seldom quantitative techniques
Timeframe	From 1 to 5 months	Short, from 6 to 12 months	From 1 to 3 years
Cost of strategy development	Low	Low	Higher
Strategy implementation	Immediate	Possibly fast (low resistance to changes)	Over a longer period of time (higher resistance to changes)
Strategy performance monitoring	Direct	Direct	Indirect
Possibility of modifying the strategy	Within a short period of time	Within a short period of time	Usually over a longer period of time - depends on the specific nature of the enterprise

Source: Own materials

It is also worth noting that SME activities are focused on using mainly money market solutions, and they often forget, and even are not aware of, the solutions that the capital market offers. And yet, the functioning and rules of the financial market, as well as the access to it, are now global.

3 Knowledge management in SMEs

Essentially, the use of concepts associated with the idea of paradigm seems unquestionably prevalent in any area. They are created in the form of scientific theories recognised by most researchers. Why, then, can one so often see a dogmatic approach to scientific issues in the literature regarding the theory of the subject matter in question? Knowledge management is about intellectual resources and, for that reason alone, is not only a complex but also an interdisciplinary issue, as it touches upon social capital and human resources – thus sociology and psychology – and as regards the behaviour and attitudes of both managers and their people – also philosophy and ethics. Nowadays, business information has become an academic subject, the various aspects of which, whether economic, technical, psychological, sociological, linguistic, legal or ethical, are discussed in detail, with topics ranging from economic benefits of information, its usefulness, costs and profitability, to the use of psychological effects of information in marketing and building market position. The concept of information is gaining increasingly spectacular definitions, and the processes

associated with it are being referred to as the most important factors of success in the modern, highly competitive market.

Skilful acquisition and use of available knowledge resources can be a factor in increasing the efficiency of management processes, and thus directly affecting the level and effectiveness of one's business goals. T. Khun claimed that "the man who makes an attempt to solve a problem defined by the existing knowledge and technology has no broader horizons. They know what they want to achieve and, in compliance with this, they design their tools and they are driven by their own thoughts". Thus, he paints a picture of scientists as biased and conservative thinkers who seek to confirm in reality what they have been taught and what has been applied in existing theory as an authoritative way to solve problems.

The building of learning organisations is not easy – neither in theory nor in practice. Introducing new solutions is always accompanied by changes. Usually, these are not perceived positively by employee teams, especially when they are accompanied by an element of innovation – to eliminate human error. The promoter of a knowledge-based society, P. Druker, at the end of the last century defined the changes that must take place for such a society to come into existence. Knowledge has become widely available and its absence does not justify incompetence or ineffectiveness. He predicted that poverty is experienced by countries, organisations or people who are backward and ignorant. A knowledge-based enterprise is, therefore, no longer an innovation. In the face of ubiquitous globalization, it is a necessity in order to "first and foremost – survive". Therefore, the answer to the knowledge management question should be sought among aspects of internationalisation, because there should be no "whether", but "how and when" to start going global. The relevant literature discusses the issue of knowledge management primarily in relation to large enterprises, ignoring the specific nature and possibility of adapting solutions to the opportunities and alternatives offered by micro scale. Any attempt which illustrates the implementation of solutions related to knowledge management among SMEs is, therefore, a valuable sample showing the perspectives and variants possible for this sector.

3.1. Methodology

The article presents, against the background of a literature review, the results of own research conducted in the years 2016-2018 on a group of over N=300 Polish entrepreneurs representing the SME sector. Those results were analysed in terms of: (1) nominal variables, (2) qualitative characteristics, (3) continuous quantitative traits, (4) discrete traits. The results have been compiled into summaries in order to better illustrate the differences occurring in SMEs conducting various types of economic activity, which had been divided by source of financing to fund their business (I – entrepreneurs who use capital market solutions; II – entrepreneurs who do not use capital market solutions).

The results indicate certain differences, gaps and threats occurring between the perception of the issue of knowledge management in Poland in terms of the place and legal status of the business, as well as the socio-economic impacts observed by SME owners in terms of behaviour, expectations and choices made by those who manage enterprises of this size. The issue of perception of the role of information in business and the specific nature of some areas of its tasks and functions against the background of empirical research is presented. To obtain the results, mathematical analysis tools and elements were used, and the responses and trends elicited from the respondents were demonstrated using tables and graphs, based on a group administered questionnaire containing open and closed questions based on a 5- and 7-point Likert scale, and a chi-square test. The enterprises were examined

in order to compare the level of involvement and implementation of knowledge management processes among SMEs operating in the Polish market.

3.2 Knowledge management in SMEs in the light of empirical research

The results of research conducted among SMEs operating actively in the region of Wielkopolska showed that willingness to improve knowledge about the capital market decreases as the size of the enterprise increases among those who have used capital market instruments (enterprises I: micro – 94.4%, small – 90.3%, medium-sized – 87.5%, respectively). However, the same does not seem to be true for enterprises which have not used any capital market solutions (enterprises II: micro – 84.8%, small – 95.1%, medium-sized – 94.6%, respectively).

Due to the multifaceted nature of the concept of knowledge, as regards both qualifications and competences indicated by the owners in relation to barriers – among which the barrier associated with finding qualified employees came in second place – this issue was analysed in terms of using capital market instruments by micro, small and medium-sized enterprises. Among the respondents from both surveyed groups, there was not a single area of training found which would not require the improvement of knowledge on sources of financing (Table 2).

Table 2. Structure of entrepreneurs declaring the need to raise the level of knowledge in the field of sources of financing [%]

ENTREPRENEURS I							
YEARS	2016-2018						
SME	0	1-4	5-9	10-24	25-49	50-249	Total
Stock exchange	57.9	37.5	44.4	42.9	58.8	54.2	51.6
Private equity	57.9	12.5	22.2	35.7	52.9	29.2	38.5
EU schemes	73.7	87.5	77.8	78.6	82.4	70.8	76.9
Public funds	47.4	75.0	66.7	57.1	64.7	50.0	57.1
Banks	26.3	50.0	22.2	21.4	35.3	33.3	30.8
No answer	10.5	0.0	0.0	7.1	11.8	12.5	8.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
ENTREPRENEURS II							
YEARS	2016-2018						
SME	0	1-4	5-9	10-24	25-49	50-249	Total
Stock exchange	65.4	52.0	46.3	57.7	60.0	62.5	57.4
Private equity	38.5	28.0	17.1	30.8	37.1	33.9	30.6
EU schemes	50.0	60.0	58.5	69.2	80.0	62.5	63.6
Public funds	30.8	44.0	34.1	61.5	57.1	50.0	46.4
Banks	23.1	36.0	26.8	34.6	45.7	35.7	34.0
No answer	19.2	16.0	12.2	7.7	2.9	5.4	9.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Own research

Analysis of the shares of data obtained in 2016-2018 indicated interest in both training on the stock exchange and private equity funds. Among entrepreneurs I, self-employed individuals (57.9%) and small companies employing more 25 people (58.8%) are interested in the stock exchange. Similar figures were obtained for private equity funds (57.9% and 52.9%, respectively). Among entrepreneurs II, the highest interest in expanding knowledge on the opportunities offered by the stock exchange was expressed by self-employed individuals (65.4%), followed by small enterprises employing more than 25 people (60%) and medium-sized companies (62.5%). They are, however, definitely less interested in private equity than entrepreneurs I, and, at the same time, declare a high level of willingness to broaden their knowledge about the opportunities offered by EU programmes and public funds (Charts 1 and 2).

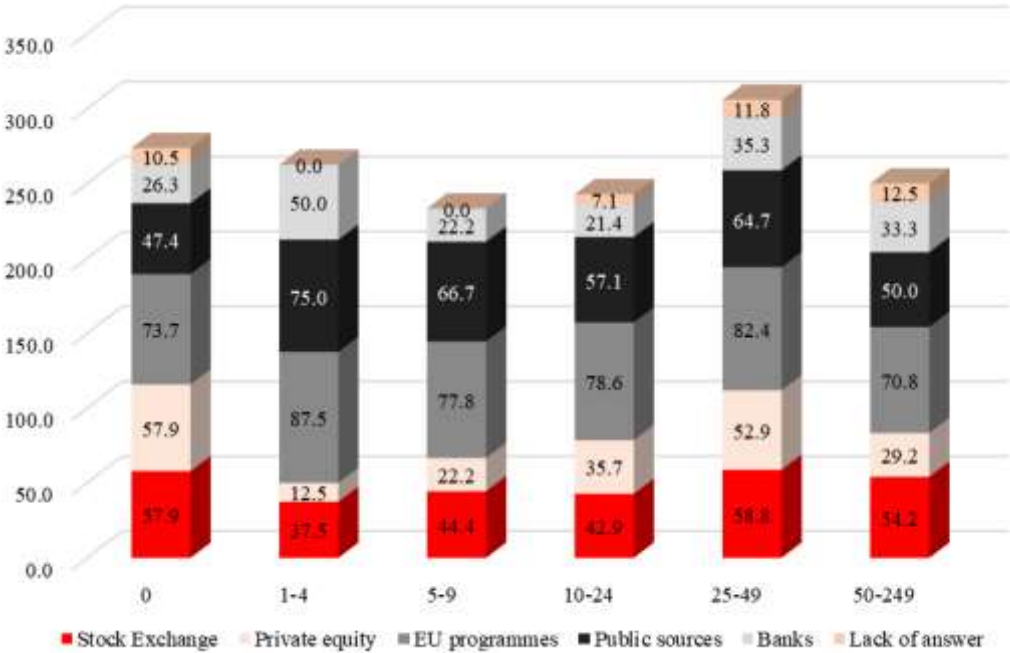


Chart 1. Structure of enterprises I willing to gain more knowledge [%]

Source: Own research

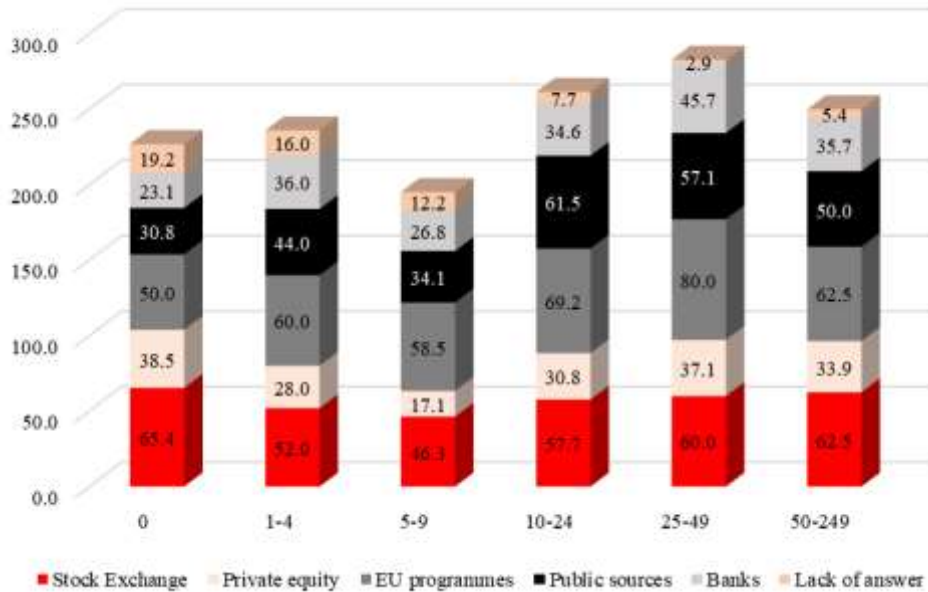


Chart 2. Structure of enterprises II willing to gain more knowledge [%]

Source: Own research

The surveyed entrepreneurs pointed to issues that they would like to learn about more by participating in training courses. In both groups (I + II), their share was in excess of one-third, with entrepreneurs I being more interested in private equity solutions, and entrepreneurs II – in the stock exchange (38.5% and 32.5%, respectively) (Charts 2 and 3).

When comparing trends between the analysed enterprises, it should be noted that they are not homogeneous, either in the case of the stock exchange or private equity funds. Over three successive years the figures described below were obtained.

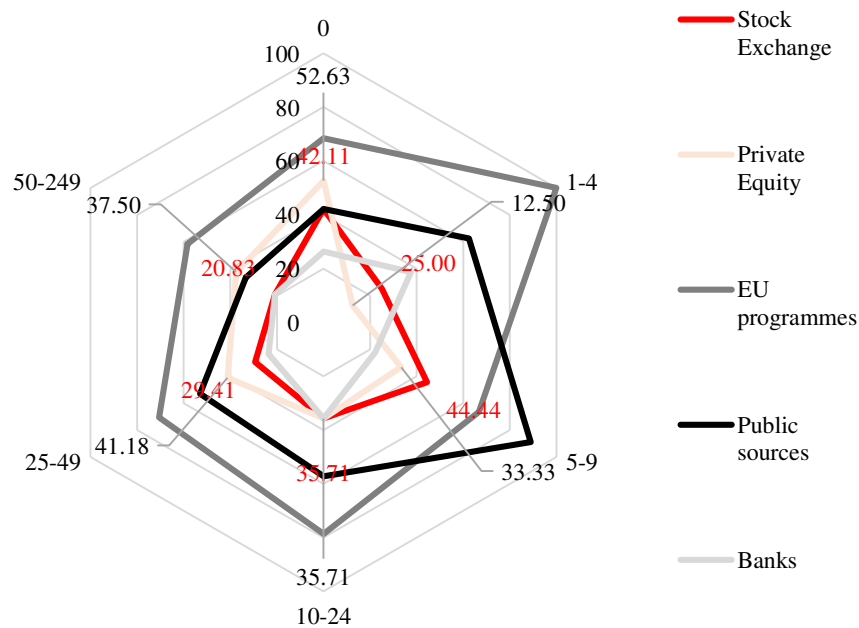


Chart 3. Share of entrepreneurs I willing to participate in training courses [%]

Source: Own research

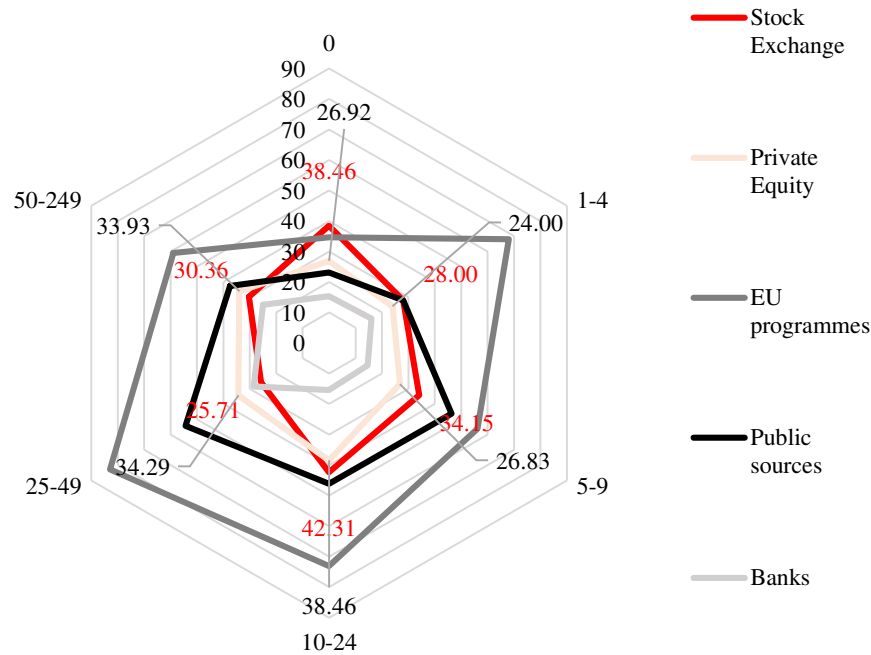


Chart 4. Share of entrepreneurs II willing to participate in training courses [%]

Source: Own research

For the stock exchange: 2016 – 35%; 2017 – 38.7%; 2018 – 25%, and for private equity: 2016 – 30%; 2017 – 45.2%; 2018 – 37.5%. Similar dependencies are found among entrepreneurs II: training courses on the stock exchange: 2016 – 31.3%; 2017 – 40.6%; 2018 – 25%, and on private equity: 2016 – 27.5%; 2017 – 34.8%; 2018 – 31.7%. Top interest was generated by EU programmes: 70.3% for entrepreneurs I and 62.2% for entrepreneurs II. Interesting conclusions are also revealed by statistics on the number of enterprises which are committed and willing to participate in training courses: 100% among entrepreneurs I and 67% among entrepreneurs II (Charts 3 and 4).

The research results lead to the conclusion that, quite clearly, the owners of enterprises who had become involved with the capital market are willing to constantly improve their qualifications and knowledge about solutions that provide effective sources of financing. This aspect is important because issues related to knowledge management in knowledge-based economies are becoming increasingly significant. The human role – after all the enthusiasm associated with maximisation of processes, their optimisation and propagation onto all areas of management – returns to important issues of effective management, becoming a continuous process in shaping the knowledge element, and to the importance of business information and building lasting relationships on every possible relationship platform. Once again, know-whom positioned itself beside know-how, both in the literature on the subject and in economic practice.

In view of this picture of knowledge on capital market instruments as well as the willingness to implement continuous training processes in the surveyed companies, entrepreneurs indicated the amounts that they would be willing to spend on training. Although in each of the years under examination business owners were willing to spend the most on stock exchange and private equity training, the price of which should, in their opinion, average between PLN 309 and PLN 679 (about EUR 74-162), with the stock market being valued the highest, those figures remain definitely insufficient to organise any training.

Therefore, it can be concluded that either acquiring professional knowledge continues to be perceived by SMEs in terms of cost rather than investment – and the lower it is, the better the efficiency of the enterprise – or their knowledge of market prices for improving qualifications is extremely scarce, making them unaware of market conditions in that area. The latter possibility implies another conclusion – entrepreneurs do not use external training to improve their own qualifications and those of employee teams in the area of obtaining effective sources of financing.

The results of research on training courses were elaborated on through additional analyses regarding the occurrence of dependencies resulting from a possible correlation between having previously used external financing and the amounts allocated by entrepreneurs for training (Table 3).

Table 3. Willingness to pay for training on the stock exchange and private equity among entrepreneurs I and II

TOPIC OF TRAINING	Entrepreneurs I						Entrepreneurs II					
	N	Levene's test for homogeneity of variance				Two-tailed significance	N	Levene's test for homogeneity of variance				Two-tailed significance
		F	Signific.	t	df			F	Signific.	t	df	
STOCK EXCHANGE	65	7.133	0.01	1.745	63	0.086	152	20.584	0	2.853	150	0.005
PRIVATE EQUITY	65	22.052	0	3.062	63	0.003	146	9.343	0.003	2.102	144	0.037

I – entrepreneurs who use capital market solutions; II – entrepreneurs who do not use capital market solutions

Source: Own research

Having adopted the significance level commonly used in social sciences, $\alpha = 0.005$, chi-square stochastic tests and Levene’s test for homogeneity of variance were carried out, which revealed the existence of a stochastic relationship, therefore it can be concluded that entrepreneurs who have used external financing are willing to pay more for training on both the stock exchange and private equity funds. No similar correlation in the area of public funds and banking was found.

Conclusion

Small and medium-sized enterprises have always been accompanied by one goal: “first and foremost – survive”. Knowledge management involves possession of knowledge. This, in turn, is a collection of information that is not necessarily sufficiently appreciated by the managers in the SME sector due to the very large share held by the business owners themselves and their often patriarchal system of doing business. The results of the research indicate certain diversity both in the way of managing knowledge and the possibilities of acquiring it. This concerns both the ability to choose the necessary training which will improve qualifications among managers and employees, but, above all, to see the needs in order to enable progress of the surveyed enterprises. Own research has shown that small and medium-sized enterprises are knowledge-oriented and aware of its importance for the development of the company, especially those that use alternative sources of financing from the capital market for their development. At the same time, the use of processes related to the management of knowledge categories and the willingness to improve qualifications in the surveyed areas was discovered. The main differences, however, are due to the legal status of the businesses, which determines the ability to use capital market instruments, therefore the perception of

the need resulting from the possibilities offered by knowledge management processes seems definitely limited.

Social sciences, by definition, enable interdisciplinarity. The results of the research indicated this component, namely practitioners who, while struggling with the day-to-day management of the company and being unable to name the processes taking place using terminology defined in the literature on the subject, do use tools indicated by renowned scientists in their academic publications. The strength and consistency of combining theory with practice, in this case – the competences and education of SME managers, is a key indicator that requires continuous improvement in enterprises of this size. Knowledge management in SMEs is, therefore, consistent with the strategies they employ and, depending on the size of the enterprise, it is both theory and practice – paradigm and experience.

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Standout knowledge management practices in Finnish companies

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Abstract: The objective of this paper is to infuse the scholarly discussion on knowledge management (KM) with fresh views and practical examples from successful KM journeys. This is done by presenting the standout knowledge management practices (KMPs) that were identified through a multiple case study among Finnish companies from different industries. Among the most effective KMPs were employee involvement in decision making, open intra-organizational communication and knowledge sharing, value-based recruiting and promoting, key employee retention through tailored career paths, as well as utilization of data analytics to support decision-making. In sum, organizations seem to develop and deploy new KMPs to keep up and take advantage of the fast-paced structural and cultural change regarding their operating environments, supply chains, customer preferences and so on. This paper contributes to the academic KM discussion by giving the practitioners a chance to discuss about the KMPs that they consider as the most effective and value creating ones. For the practitioner audiences, the paper disseminates information about the KMPs that have been developed and fine-tuned in other organizations, and which could be implemented also in their own organizations. As a limitation, some KMPs are arguably culture-dependent, which may limit the generalizability of the findings.

Keywords: knowledge management, knowledge management practices, multiple case study, Finland

1 Introduction

KM scholars and business practitioners nowadays agree that knowledge is a crucial resource for all kinds of contemporary organizations and its systematic management improves organizational performance (e.g. Donate and DePablo 2015; Cegarra-Navarro et al. 2016; Giampaoli et al. 2017). However, there is a vast gap between (1) what managers can do with the academic KM research output and (2) what KM scholars think should be done regarding KM in organizations. This gap between academia and practice has grown to its current state because researchers have focused predominantly on large knowledge-intensive business organizations and paid much less attention to some others. In addition, practitioners have approached KMP implementation rather conservatively, as they tend to be between a rock and a hard place regarding investments on organizational development and securing short-term business objectives. The objective of this paper is to narrow down the second gap by providing examples of standout KMPs that have a good track-record at the interviewed case companies and that can be adopted to other organizations without massive upfront investments.

Data for this study were collected through a multiple case study in fall 2017. Altogether, six companies participated and in each of them 3-4 directors or managers involved with KMPs and knowledge-intensive tasks were interviewed. The case companies were selected on the grounds of a longitudinal KM survey study (2013 and 2017) which generated responses from 96 companies. Based on the data, 17 Finnish companies appeared to be outstanding in terms of the level of KMPs and firm performance across both rounds of survey. So, from those 17 standout companies 6 participated in this study. Data were analyzed with a qualitative data analysis software NVivo (version 12). The coding protocol was content-driven.

This paper contributes to the academic KM discussion by identifying the state-of-the-art KMPs in outstanding KM organizations. The results of this paper should be used, for instance, to refine the existing KM surveys to examine with a large sample of data if these standout KMPs can help understanding what really influences the company bottom-line. Another idea is to conduct similar multiple-case studies in other countries, to enable comparison of the standout KMPs in different contexts. For practitioner audiences, the paper provides practical examples of the KM practices that can be directly implemented in their organizations. As a limitation, some of the KM practices are culture dependent (Hussinki et al. 2017), which may limit the generalizability of the findings. Therefore, a future study could interview directors in different countries and compare the results with this study.

2 Knowledge management practices

KMPs are organizational and managerial practices, which support the efficient and effective management of knowledge for organizational benefit (Andreeva and Kianto, 2012). KMPs typically exist in bundles where a varying kind of set of concrete practices is used in conjunction to enact a particular KM function. When executed, KMPs will increase the intensity of knowledge processes (such as knowledge sharing and knowledge creation) in the organization and the amount of intellectual capital available to the firm (Kianto et al., 2014; Kianto et al., 2017)

Following the Hussinki et al. (2017) article, in this research KMPs were defined as follows:

- Supervisory work: Supervisors support and encourage employees to knowledge sharing, open and equal communication and critical approach to existing knowledge and business processes. In sum, supervisors are in a key role in the development of KM-friendly organizational culture, by ensuring that knowledge at all organizational levels is appreciated equally.
- Strategic management of knowledge and competence (strategic KM): Strategic planning and implementation activities consider the current and future organizational knowledge and competence needs and eyes for solutions to acquire or develop the identified knowledge.
- Knowledge protection: Strategic knowledge is protected through variety of formal and informal means, such as patenting, licensing, non-disclosure agreements and employee orientation.
- Knowledge-based human resource management practices practices, including:
 - o Knowledge-based recruiting and selection: Recruiting and selection criteria are adjusted to cover the needs of knowledge work and dynamic business environment. The candidate's learning potential, personal values and social competence consists the key criteria.

- Knowledge-based training and development: Training and development opportunities are both diverse and tailored to individual needs. Different starting levels and learners are considered in the personnel training and development plan.
- Knowledge-based compensation: Employees are rewarded based on their knowledge creation, sharing and utilization.
- Utilization of information technology (IT practices): IT systems are integrated and user-friendly, and they support knowledge work, business processes and decision-making. IT is utilized in efficient intra and extra-organizational communication, knowledge sharing and knowledge re-use.
- Data-driven management: The organization has access to adequate data and analytics competence to support decision-making. Decisions are based on analyzed data rather than assumptions.

3 Data collection and analysis

Data for this study was collected through a multiple-case study in Fall 2017. The case companies were selected based on a longitudinal KM survey dataset (2013 and 2017) that was collected from Finnish companies with at least 100 employees. The suitable companies were identified from the survey data based on the level of utilization and comprehensiveness of their KMPs, as well organizational performance measured as subjective assessment of market performance against similar competitors. This approach increased the likeliness of finding companies which know what they do in terms of KM and could share examples of standout KMPs. After applying these criteria to the dataset, a shortlist of 17 companies that had done better than average in terms of the KMP and firm performance across both datasets, emerged. These shortlisted companies were contacted by phone in early Fall 2017 to set the dates for interviews. Eventually, six companies agreed to participate in the study and 3-4 directors in each company were interviewed during Fall 2017.

The themes for the semi-structured interviews were attained from Hussinki et al. (2017) and further developed and modified to better suit the objective of this study. The interview themes handled supervisory work, strategic KM, knowledge protection, knowledge-based HRM practices, IT practices, and data-driven management.

All the interviews were transliterated by a professional research service provider. After that, the transliterated documents were coded. The coding protocol was content-driven, meaning that the codes were created during the coding process without using strict pre-determined code structure. The reliability of the coding process was tested by cross-validating the coding output of two researchers who performed the same coding task to a randomly selected sample of text. The analysis was done by comparing the emerged code to the KMP theory.

4 Results

4.1 Supervisory work

Supervisory work is the embodiment of the organization's vision of how it wants to treat its employees and knowledge resources. Supervisors have a key role in creating a knowledge-

friendly organizational conditions for KM (DeTienne et al. 2004) that are characterized by trust, respect and creativity (Holsapple and Singh 2001). These conditions are achieved through employee participation, inspiring and support, as well as task delegation and coordinated knowledge integration within a firm (Birasnav 2014; Grant 1996; Sarin and McDermott 2003; Singh 2008).

The interviewed case companies showed perfect examples of such inclusive and positive managerial practices. Especially Company D stood head and shoulders above the other case companies, as they had an extremely well-planned and executed way of transforming the way their supervisors and managers work. When their current CEO started working in the company, the information and knowledge flow was clogged. There was not enough meaningful interaction and communication between supervisors and employees, while the new CEO felt that the company had loads of good knowledge and experience from its business but was not able to tap on it in decision-making or business process development. Therefore, something needed to be done to open the floodgates of knowledge. The first step was to transform the way supervisors and managers communicate about the past, current and future issues to their employees. The logic here is that it is much easier to change the way a handful of people communicates than change the behaviour of the entire organization at once – starting from the employees. In addition, the new CEO hoped and even expected that the open communication example set by the supervisors and managers would eventually catch on within the entire organization and personnel. The new trend of open communication started from the monthly CEO information and discussion sessions, which were streamed also for the staff members who worked at the customers or other remote locations. This enabled the entire organization to stay on the map of success stories, areas of improvement and possible areas of change, which improved the flexibility and adaptability, as well as reduced uncertainty.

“We communicate as openly as possible. Our CEO talks about issues, such as new projects and changes, that might be in their early stages of planning and might not eventually even materialize.” (Company D)”

The second step was to activate the down to top knowledge flow. To do it, the supervisors did not just sit back and wait for their employees to come and share their knowledge and ideas with them, but they worked extremely hard to engage their employees. The CEO demanded that every supervisor had to talk, share ideas and co-solve problems with their employees on regular basis. At first it was quite awkward for sides as they were not accustomed to such open and active interaction, but as the time passed also the new norm grew on the personnel.

“We have dismantled the barriers to talk, listen and collaborate. Nowadays our employees are in the core of our decision making, because the supervisors and managers listen them actively – not passively.” (Company D)

“The things did not change in matter of days or weeks, but it took two years of hard work to establish this completely new culture and take things where they are today. (Company D)

On top of that, to seize its knowledge sharing potential, the company established a new team-level compensation scheme, which enabled a team-level annual bonus only if the team had produced a minimum of five business process development ideas in that year. The results

were quite staggering: The third year after the change was initiated the company's 300 employees generated nearly 200 process improvement ideas. It is obvious that if even a fragment of those ideas were applied in practice, the company had made a very good decision in changing its communication and knowledge sharing culture.

"One concrete example is that each of our teams has to create at least five new development ideas in a calendar year, to stand a chance to get their bonus. We have set up a new system to collect the ideas, and, in only nine months this year, we have been able to collect 171 development ideas. (Company D)"

4.2 Strategic KM

Strategic KM consists of strategic development, implementation and monitoring activities, which consider knowledge as the organization's key resource (Hussinki et al. 2017; Kianto et al. 2014). Especially, it relates to the long-term knowledge and competence needs of the firm and securing the firm's future by finding its ways to acquire or develop the needed knowledge and competence (Zack 1999; Kianto 2008). Strategic KM helps organizations to establish sustainable knowledge-based competitive advantages over their rivals (Zack 1999) by allowing managers to learn more about its knowledge base and make better-informed decisions concerning the allocation, utilization, expansion and sharing of the organization's strategic knowledge (Zack 1999; see also Von Krogh et al. 2001).

Company A representatives discussed how they opened their strategy formulation and updating sessions also for the external stakeholders. Nowadays, the company's board, together with their internal and external key stakeholders, kicks-off the new strategy period with a collaborative brainstorming and knowledge sharing session to involve as much vision and innovativeness as possible. The goal is to implement such strategy that covers various perspectives on what the customers might want tomorrow and what is the role of the company in the society. This could be well the key ingredient of how the company achieves its competitive advantage, as they have superior access to stakeholder knowledge than some of their rivals have; thus, the company's management is able to make better-informed decisions on their strategy and future.

"We kick-off our new strategy period together with our stakeholders. We collaboratively brainstorm what is important in the society and in the business, we operate in. The group consists of our customers, owners, operators from various industry sectors..." (Company A)

The Company A is not relying solely on their multi-stakeholder strategy sessions, as they have also invested in an ongoing and daily strategy work by recruiting a senior strategy advisor. Her only task is to zoom out and scan what happens in the business and society, and to report the strong and weak signals to the board of directors. Based on these signals, the board makes decisions on how to adjust the course of the company and to offer more value for their customers.

"The pace of change just keeps on getting crazier. We must do everything we can to keep up with it and even make efforts to predict the changes by reading the weak

signals. Here the group of different stakeholders is extremely valuable for us. As a concrete example of our ambitions, we created a full-time senior position for a director whose only task is to zoom outside – to scan the market and society for potential disruptions and changes.” (Company A)

4.3 Knowledge protection

Knowledge protection at first glance does not appear as similar KM enabler as for instance supervisory work and strategic KM. However, it is a key KMP for appropriating returns on knowledge and innovation (Hurmelinna-Laukkanen and Puumalainen 2007), while it is also said to facilitate knowledge sharing and collaboration with the firm’s external stakeholders (Olander et al. 2010). Therefore, knowledge protection should not be confused with knowledge hoarding, as the latter is a negative phenomenon associated with self-interest and politics (Rhee and Choi 2016). There are formal and informal knowledge protection mechanisms and practices (Lawson et al. 2012; Hurmelinna-Laukkanen and Ritala 2012). The formal ones include e.g. patenting and licensing, whereas the informal practices consist of different employee orientation activities.

The interviews revealed that the case companies focused more on employee orientation and training activities than formal means or technological solutions. This makes sense from the KM standpoint, as establishing a new code of conduct is likely to be less harmful for e.g. knowledge sharing and re-use than strict access rights or knowledge blocking/siloing. Employee training tends to be highly utilized especially during when something changes in the operating environment or surrounding society, as happened with the European Union’s General Data Protection Regulation (GDPR) that came to effect in 2018.

”Knowledge protection begins from new employee orientation, but when the regulations or requirements change, like now with the European GDPR, it comes down to employee training and education.” (Company D)

Firms of today, especially the medium and large-size companies, have multiple locations and their employees quite often work outside the company’s physical premises at customers’, subcontractors’ or sometimes even at competitors’ office. In these situations, employee orientation on e.g. safe laptop usage and sensitive knowledge disclosing becomes crucial. Avoiding communication and knowledge sharing are not good options, because then no learning or innovations can take place. Better solution is to prepare the employee to operate as freely as possible within carefully considered and set limits.

”We discuss about knowledge protection issues with our employees, especially when someone is occasionally working elsewhere.” (Company B)

Even though the informal knowledge protection practices were more utilized ones in most of the case companies, there was one company that had taken care of sensitive knowledge protection with an IT system, which recognizes and blocks sharing of sensitive knowledge, such as pricelists and customers’ personal information outside the IT system. In a sense, this kind of solution makes knowledge workers’ daily job easier, as they do not have to pay constant attention to what knowledge can be shared with various different internal and external stakeholders.

"We have a huge amount of all kinds of document and records, manuals, contracts, etc. They have been created and stored in such manner that they cannot be shared or sent outside our system. Not even by accident. This is how we can avoid wrongdoings and mistakes." (Company F)

Curiously, one interviewed company had very mixed feelings about knowledge sharing, as one interviewee rooted for employee guidance and training while another person from the same company trusted that technology is the key. It can be argued that both solutions might work – depending on the firm's knowledge and document-intensity. Those firms that rely on tacit knowledge as their primary asset will not benefit significantly from investments in IT-enabled knowledge protection, as humans and their knowledge cannot be confined within an IT system. However, those firms that consume and create heaps of documents and records may gain significant benefits from technology-enabled knowledge protection because it reduces the knowledge workers' uncertainty of what can and what cannot be shared.

"Yes, guidance and training is everything." (Company C)

"Everything comes down to technology." (Company C)

4.4 Knowledge-based HRM practices

Human capital, that is the knowledge and competence embedded in employees, is the most valuable knowledge resource of the firm and the only resource that is capable of thinking (Edvinsson and Malone 1997); therefore, the HRM practices have a tremendous influence of over the firm's long-term future. In this study, the HRM practices were divided into three subsections consisting of knowledge-based recruiting, knowledge-based training and development, and knowledge-based compensation. These all are important managerial activities within a firm: For instance, recruiting influences knowledge acquisition, training and development improves organizational learning, while compensation influences knowledge sharing (e.g. Lin and Kuo 2007; Soto-Acosta et al. 2014). HRM, however, has never been more complicated than today, as the jobs and tasks have grown in complexity which has set quite new requirements for employee skills and knowledge. It can be argued that multi-skilled employees and cross-disciplinary knowledge have never been more valued than today.

This also shone through in the case company responses regarding knowledge-based recruiting. The case companies no longer use their time on finding candidates with highly-specific skill-sets or job or task-specific experience. They rather focus on finding individuals with social competence, motivation to learn, and right kind of personal values. These are such traits that cannot be taught, unlike the job and task-specific things that can be learnt by anyone with enough motivation.

"When recruiting, we do not pay that much attention to the candidate's experience from similar positions, because it simply does not matter. Things that really matter are the candidate's motivation and personal values. A person can learn anything if the motivation is there." (Company D)

The same thinking applied also to managerial recruiting. Recruiting of managers and directors is a delicate issue because errors and bad recruits may lead to unexpected consequences.

Where companies go typically wrong, according to our case interviews, is when they apply wrong kind of recruiting criteria, such as the track record in non-managerial task e.g. sales or marketing. Instead, it is better practice to focus on such personal attributes that support the managerial candidate's future job as a manager/supervisor.

“Managerial recruiting is very delicate issue, in terms of who is selected to lead others. We have selected wrong types of personalities but more importantly have not hesitated to make moves to correct our mistakes. Overall, our leaders must like their work and like to work with people.” (Company D)

Another view that stood up in the recruiting theme was knowledge complementarity. The HR director of the Company A said it best that knowledge complementarity is a major driving force of innovation and knowledge creation. In other words, too many similar employees will not be as creative in a long run as a bunch of people who have differences in professional backgrounds, education, knowledge, experience and skills. Thus, companies should make sure that teams avoid stagnation by always aiming at introducing newcomers who bring something new to the group.

“The aim of recruiting is to develop teams that are as diverse as possible, with different personalities and expertise, which eventually creates us an edge.” (Company A)

“When we identify knowledge or competence gaps for instance in our growing business areas, we recruit individuals who could narrow down the identified knowledge gap and grow into that position.” (Company C)

The society, businesses and organizations are changing all the time, as is the knowledge that is required to understand how they function. Even the most talented and bright individuals need updating of their knowledge and competence, or else they are in danger to become useless and forgotten (Aguinis and Kraiger 2009). Training and development scheme should start from a comprehensive new employee orientation period. Comprehensive orientation helps new staff members to become a good work mate, as he/she gets to know the new colleagues and social collective, learns to use the key tools and technologies, and gets an idea of how things are done at the new organization.

“Despite our resource constraints, we invest heavily on employee orientation and training. The tailored two-week orientation package includes orientation to organizational culture, colleagues, way of working and of course one's new tasks. For me, personally, it was a wow factor!” (Company A)

Company A stood out from the rest also because of their tendency to utilize their own experts to carry out various different training and development activities. They believe that their own employees are more cost-effective than the external consultants and the message is more believable when it comes from their mouths. This is something that other companies could also use more, but first they have to make a knowledge audit of who knows what.

“I usually scan our internal expertise before contacting any external coaches. I feel that teaching is more efficient in internally conducted courses, and on top of that, we avoid the typical risks related to consulting services.” (Company A)

Training and development collaboration with other organizations was also a familiar concept for some of the case companies. Company D had done it already for some years together with the local municipality and the summer university. There are primarily two benefits that stand out. First, the costs of the education programs are shared between more parties and participants, which makes it more cost effective. Second, when there are participants from several organizations, the courses offer a lot more for the attendees in terms of conversations, idea sharing and new views. They can be used even as talent scouting and recruiting channels!

“... we collaborate with the Summer University and then we have a training partnership with the City. We have hired young people through these collaborations and some of them have stayed permanently! (Company D)

Lastly, one of the case companies viewed the retention of its key knowledge and brightest individuals as a crucial HRM task. The knowledge retention theme was not originally included in the semi-structured interview template, but eventually it stood out as the fourth sub-category of the knowledge-based HRM practices. It may be argued that recruiting the right employees, offering them opportunities to develop, and admitting rewards for a job well done should already work for their retention. However, none of these practices, adopted from Hussinki et al. (2017) framework, does not discuss about identification and retention of the key employees. Therefore, it seems that more specific retention practices are needed even in the best KM firms. Companies can increase employee loyalty and decrease the human capital turnover by, for instance, enabling intra-organizational promotion and career development paths and by improving their supervisory work (Eisenberger et al. 2002). Job satisfaction and sense of purpose are things that the modern employee is considering when planning his/her future (Brown and Yoshioka 2003).

“The challenge number one is to retain our key employees. We do not want to lose our most valuable experts, so we have developed a definition of key personnel. It means that we pay attention to identifying certain types of employees and we do everything we can to keep them. Key employee retention supports continuity, as it buys time for successors to mature before they take over.” (Company E)

4.5 IT practices

In the KM literature, the firm’s knowledge resources are traditionally divided into those that are tacit by their nature and those that are explicit. However, as the role of data and analytics has grown bigger during the last decade, it makes sense to update also the categorization and recognize the status of data more explicitly: 1) Tacit knowledge is embedded and available through humans and relationships between them, 2) unstructured information exists in forms of all content that is created for human consumption such as documents and multimedia, 3) while structured data must be first processed by computers to make it understandable for

human decision-makers. Then there is also Big Data, that is a combination of huge number of unstructured information and structured data, typically attained from several different sources. Naturally, the utility and role of IT systems is the most pronounced when dealing with the large amounts of structured data that can be read only by computers, but it does not end there. As a matter of fact, all three types of knowledge resources can be leveraged with computers systems. For instance, collaboration and communication systems support interaction between humans and enable online document co-creation, whereas content management systems enable more controlled and efficient capture, creation, editing, storing, retention and removal of all content types. The key here is that the firm invests in such IT systems that support its business and knowledge processes (Cao et al. 2013; Kamhawi 2012).

Rather curiously, two of the interviewed case companies analyzed that their strength in IT investments and utilization was their cautious approach towards IT purchases and new technological solutions. The main objective of their IT units was to keep the critical business systems up and running, as almost all business functions would halt if the systems were down. Therefore, these companies rely on wide spread and already proven IT systems that provide value for money. KM scholars have found it quite difficult to explain, why their empirical findings on the relationship between IT investments and firm performance suggest negative direction (Malhotra 2005). The findings of this study might provide one explanation, as it suggests that firms can achieve good performance levels without heavy investments on IT. However, more research with large number of data is required to confirm whether this hypothesis is true.

“We are not one of those companies that implement new systems and technologies as soon as they become available. We deliberately sit a little bit behind, as we want to make sure that we purchase reliable technologies that can provide real business benefits.” (Company D)

“Some of our production systems are functionally rather basic, cost-effective ones. They have been developed for quite some time and implemented globally, so they are also affordable and reliable. With this approach we minimize the risk of getting caught by system failures that may temporarily hinder our operations.” (Company D)

4.6 Data-driven management

Data-driven management is discussed separately from the IT practices, as it concerns the firm’s decision-making culture and way of working, rather than an IT system-oriented issues. Data-driven management exists when decisions are made based on facts (usually analyzed data) and does not exist when decisions are based on opinions and non-factual reasoning. As long as there are humans making decisions in firms, there is no chance that the firms can be perfectly data-driven. That is not necessarily a bad thing at all, and the academic frontier is trying to find an optimal balance between data-driven and intuitive decision-making (Vanlommel et al. 2017). The firms create and capture data in their own enterprise resource planning systems and through different transactions. In addition, there are external data sources, such as customer data bases of other organizations and public databases, that can be

purchased and used to enrich the existing data. Even though many organizations have access to nice amount of potentially valuable data, only some of them can create value based on the data.

One of the case companies had started to pay attention to data credibility and visualization to increase data-driven decision making in their numerous branch offices. Until now, the company has struggled to leverage its data because it has been presented mainly in lengthy written reports and complex statistics. The branch managers are too busy to really familiarize themselves with the reports and statistics, so the company had to come up with a new approach to present the information in a more brief and visual manner. They expect that the new reporting style will increase the business impact of their data analytics, as the information will be more effectively disseminated and consumed. In addition, the company had started to combine more data sources in their internal reports to awaken the interest of their branch managers regarding how they were doing compared to other offices and business in general.

“During the current strategy season, we want to improve data credibility, so that people do not have to doubt it. We also want to make our knowledge more visual and easier to access to our office managers in different locations for instance with their mobile phones. Our goal is to establish so called traffic light indicators for our office managers for quick self-analysis.” (Company B)

“It is one of our highest priorities to get access to factual knowledge and let it drive our operations.” (Company B)

“During our current Business Intelligence project, we have started to combine different data sources to provide our managers and leadership with measures, indicators and statistics. We are talking about highly structured data.” (Company B)

Another case company had started to invest especially in customer data analysis. The company’s core business processes have been digital for years and they generate all kinds of transaction data in big quantities and in readily analyzable form. However, they have found it challenging to recruit such data scientists who would also have a deep understanding of their business and core processes. As these “unicorns” are hard to find and expensive (highly paid), this poses a dilemma for companies: Does it make more sense to train and educate the business experts as data scientists, or the other way around?

“We collect pretty much all the data the customers create and leave at our Web-services.” (Company E)

“We want data-ninjas and data-rambos who are able to use data to establish a real understanding of what happens in the customer interface; private and business customers and their needs, customer behavior in different situations, understanding of the customer journey.” (Company E)

5 Discussion and conclusion

This study aimed at reporting on what the companies that are outstanding at KM actually do in terms of KMPs. This was done to provide a breath of fresh air to the academic KM

community and to give benchmarks and guidelines for other organizations that want to improve their KM and general performance. Six Finnish firms with at least 100 employees participated in the study, so that 3-4 directors or managers per company were interviewed.

According to the results, the case companies utilized various kind standout KMPs, which were related to e.g. open communication, strategy work with external stakeholders, team-based rewards for knowledge-based activities, and conservative approach to IT purchases. Considering nearly all the standout KMP examples that were mentioned in this paper, the unifying factor is that they try to improve the flow of relevant knowledge to the decision-makers, so that they could make more informed decisions. For instance, the communication and interaction opening work that was done in the Company D, aimed at increasing the down-up knowledge flow even though it stated with increasing the up-down flow. In addition, the Company A's decision to involve also the external stakeholder groups in their strategy work was intended to improve the company board's understanding of their business and the surrounding society. Third, by hiring socially talented employees, by updating their knowledge, by admitting rewards for knowledge sharing, and by doing the necessary to offer them motivating and interesting career paths, the interviewed companies wanted to secure good knowledge sources throughout the organization and retain them long-term. It can be also argued, that the improved data analysis and reports support especially the managers' and decision-makers' job, as they are the ones who receive most of the analytics output.

The results of this study would have been probably different if the interviews had targeted the employees instead of supervisors. One idea for future research is to do similar round of interviews among the employees and compare if and how their experiences and perspectives differ from their supervisors' views. Another idea for future research is to collect similar data from other culturally different countries, to determine whether the standout KMPs are similar across countries or if notable differences exist.

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The Roles of Market Knowledge Management System and Market Knowledge Sharing on SMEs' Organizational Performance

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Abstract: Market knowledge becomes an important factor in creating competitive advantage to an organization. Market knowledge consists of customer knowledge, competitor knowledge and supplier knowledge. Those knowledges should be managed and analyzed by Market Knowledge Management System (MKMS) in order to create an advantage to an organization. The new discovered market knowledge should be shared within an organization so that an organization can identify a new pattern, a new trend and a new preference in a market. However, majority of SMEs in Thailand misunderstood about deploying an information technology. They perceive information technology as a success factor of an organizational performance. The purposes of this study are to investigate the impact of market knowledge on market knowledge management system (MKMS). Second is to examine the effect of market knowledge management system (MKMS) on market knowledge sharing. The study also aims to examine the influence of market knowledge sharing (MKS) on organizational performance (OP). The last objective is to study the mediating effect of market knowledge management system and market knowledge sharing. The study was conducted on 209 Thai SMEs and the data was analyzed using SmartPLS 3. The results showed that customer knowledge (CK), competitor knowledge (COK) and supplier knowledge (SK) have significantly affected Market Knowledge Management System (MKMS). Meanwhile, market knowledge sharing (MKS) has been positively influenced by MKMS. Market knowledge sharing (MKS) also has positively impacted organizational performance. However, customer knowledge, competitor knowledge and supplier knowledge did not have indirect effect on organizational performance. The above findings showed that MKMS and market knowledge sharing did not have mediating effects.

Keywords: Market Knowledge, Market Knowledge Management System, Knowledge Sharing, Organizational Performance

1 Introduction

The small and medium enterprises (SMEs) sector has an important role to play in developing economies not only in economic development, but also in poverty alleviation and job creation. Also, SMEs have been recognized as an important strategic sector in Thailand for generating high economic growth, reducing unemployment, inequality and poverty. SMEs stimulate private ownership and entrepreneurial skills. SMEs organizational performance is a focal phenomenon in business studies. However, it is also a complex and multidimensional phenomenon. Performance can be characterized as the firm's ability to create acceptable outcomes and actions. For many organizations achieving improved performance is not only dependent on the successful deployment of tangible assets and natural resources but also on the effective management of knowledge. Knowledge has become a key asset and competitive advantage for many organizations operating in increasingly complex and competitive environments. Knowledge is the crucial factor behind sustainable advantage and success for organizations. Very often, the sole survival and success of an organization depends on its ability to harness and use knowledge. Therefore, knowledge, as a key asset, is fundamental to building an organization's competitive advantage.

The knowledge-based economy has brought about significant shifts in the way organizations respond to rapidly changing customer preferences and constantly shifting competition. Market knowledge becomes an important factor in creating competitive advantage to an organization. According to the Knowledge Based View (KBV) theory, market knowledge becomes an external factor which is vital and can affect an organizational performance. Market knowledge consists of customer knowledge, competitor knowledge and supplier knowledge. Those knowledges should be managed and analyzed by Market Knowledge Management System (MKMS) in order to create an advantage to an organization. The new discovered market knowledge should be shared within an organization so that an organization can identify a new pattern, a new trend and a new preference in a market. However, majority of SMEs in Thailand misunderstood about deploying an information technology. They perceive information technology as a success factor of an organizational performance. Therefore, the purposes of this study are to investigate the impact of customer knowledge, competitor knowledge and supplier knowledge on market knowledge management system. Second is to examine the effect of market knowledge management system on market knowledge sharing. The study also aims to examine the influence of market knowledge sharing on organizational performance. The last objective is to study the mediating effect of market knowledge management system and market knowledge sharing.

2 The Literature Review

2.1 Market knowledge

According to the stakeholder theory (Freeman, 1984), stakeholders refer to groups and individuals who can affect or are affected by the organization's purpose which include customers, competitors, suppliers, government, NGOs and communities (Day, 1994; Kaler, 2006; Yaziji, 2004; Holmes and Smart, 2009). They are divided into primary and secondary stakeholders. The primary stakeholders are those who are directly involved in a market

relationship such as customers, competitors and suppliers. Meanwhile secondary stakeholders, government, NGOs, communities and etc., refer to those who are not directly involved in a market relationship (Ayuso *et al.*, 2011). This research studies only on primary stakeholders.

The voice of the customers is deployed throughout the product planning and design stages (Franceschini and Rossetto, 1997). It will become an input in the product design and development (Zairi and Youssef, 1995). Customers should be the driving force behind product development. A firm which commits itself to superior customer service and integrates customer preferences and needs into its product development strategy has the best guarantee for long-term success (Gatignon and Xuereb, 1997). The new product development process has relied heavily on customer input to evaluate a product innovation's viability, design, and positioning (Zhang and Duan, 2010). Any changes in customers' demands may negatively affect the value of current marketing capabilities.

Competitors are defined as organizations or firms offering products or services that are close substitutes, in the sense that they serve the same customer need (Kotler, 2000). Competitors' knowledge would provide a solid basis of information pertaining present and potential competitors for executive actions. It also can enhance a firm's competitive advantage by allowing it to benchmark with, learn from, imitate, and improve on the products of successful competitors (Drew, 1997). A considerable body of marketing thought suggests that competitor orientation should improve an organization's performance by enabling the organization to position its strengths against rivals' weaknesses (Slater and Narver, 1994). Besides, customers' implicit needs and preferences, an organization also needs to analyze competitors' strength, weaknesses, capability and strategy in order to sustain competitiveness in the market (Narver and Slater, 1990). This rivalry view is also shared by prominent theorists in management and economics, who argue that an organization's performance largely depends on its ability to "beat the competition" either by manipulating an industry's structural parameters, as in competitive forces theory (Porter, 1980), or by developing difficult-to-imitate competencies, as in the resource-based perspective (Barney 1991). Specific competitor orientation may result from an in-depth analysis of the behavior, products, and strategies (De Luca and Atuahene-Gima, 2007).

2.2 Market knowledge management system

The development of knowledge management system (MKMS) makes an organization to retrieve needed information very quickly and on time. Organizations use different information systems to facilitate knowledge sharing through creating or acquiring knowledge repositories, where employees share expertise electronically and access to shared experience becomes possible to other staff (Connelly and Kelloway, 2003). This system is very important especially in service providing organization such as telephone operator department. Any delay in response to customers will make customers dissatisfied with the service. Tsoukas and Vladimirou (2001) found that telephone operators will retrieve customers' profile very quickly. Ideally, an organizational member will have all information they needed. Without a solid IT infrastructure, an organization cannot enable its employees to share information on a large scale. Yet the trap that most organizations fall into is not a lack of IT, but rather too much focus on IT.

Information system becomes one of the critical success factors in implementing knowledge management (Hasnali, 2002). The study shows that information system has a significant positive influence on the process of knowledge creation (Lopez-Nicolas and Soto-Acosta, 2010). A study shows that as knowledge sharing increases, the existence of information systems also increases. In other words, information systems and knowledge sharing are positively related (Al-Alawi et al., 2007). The study in small innovative hi-tech companies shows that the use of information technology (IT) assists in creating new knowledge (Spraggon and Bodolica, 2008). IT represents a valuable tool where individual, group and organizational knowledge are continuously codified, stored, diffused and renewed. It also represents a significant source of organizational learning and knowledge creation.

The study of Yang, Chen and Wang (2012) on the impacts of information technology on knowledge management practice in construction industry shows that levels of IT application are positively associated with projects' levels of knowledge management. Additionally, project outcomes can be achieved with higher levels of knowledge management. The findings also indicate IT application affects project performance in terms of schedule and cost success as well as quality and safety performance.

As IS are being improved and developed, discussions on their effectiveness and evaluation of their success have been continuously debated by researchers, scholars and practitioners (Hussein, Selamat and Karim, 2005). In an attempt to evaluate or measure the effectiveness of IS, various models and frameworks have been proposed and validated in diverse IS implementation settings. Masrek (2007) reformulated the IS effectiveness model by developing four dimensions of IS effectiveness model. Masrek's IS effectiveness model consists of four dimensions: service quality, systems quality, information quality and user satisfaction.

Service quality is defined as the users' subjective assessment that the service they are receiving from the portal is the service they expect. Aspects covering service quality include responsiveness, reliability, confidence, empathy, follow-up service and competence (Ahn, Ryu and Han, 2004). Systems quality is the measure of the portal itself and focuses on the outcome of the interaction between the user and the portal system. Items measuring system quality would include design, navigation, response time, system security, system availability and functionality (Ahn et al., 2004). Information quality is defined as a function of the value of the output produced by a system as perceived by the user (Negash, Ryan, Igbaria, 2003). Measures associated with information quality include content variety, complete information, detailed information, accurate information, timely information, reliable information, and appropriate format (Ahn et al., 2004). User satisfaction is defined as the degree to which users believe that the portal at their disposal fulfils their needs (Ives, Margrethe and Baroudi, 1983). The model developed by Masrek (2007) is adopted in this study.

2.3 Market knowledge sharing

Nowadays, the formation and use of new knowledge is necessary to the survival of businesses. Customer knowledge that has been gathered in an organization is of no use unless it is shared with those people who need to know. According to Okyere-Kwakye and Khalil (2011),

knowledge sharing has been tagged as the key element within the organizations in the 21st century. Therefore, knowledge sharing has been given great attention by both academicians and practitioners (Wangpipatwong, 2009). They further argued that sharing of knowledge is not easy to implement due to the nature of knowledge. Therefore, employees should have the ability to share, collaborate with others to solve problems, develop new ideas or implement policies or procedures pertaining to sharing of knowledge.

To create knowledge sharing culture, organizations need to encourage employees to work together more effectively to collaborate and to share organizational knowledge more effectiveness, thus, can better perform their jobs (Xiong & Deng, 2008). According to Huang and Huang (2012), effective knowledge sharing among members has become a competitive requirement for organizations. Therefore, the implementation of knowledge sharing among employees can improve an organization as a whole to meet its business objectives.

According to Kang et al. (2008), knowledge sharing is defined as the transmission or distribution of individual knowledge in an organization. Furthermore, individual members of an organization with different ideas, jobs and experiences will create new knowledge by communicating and sharing knowledge (Kang et al., 2008). In relation to this, Haas and Hansen (2007) mentioned that there are two distinct ways of transferring knowledge across organizations which are transferring knowledge between individuals and transferring knowledge through written documents.

Knowledge sharing is thought to be influenced by factors both at the individual and at the organizational level (Hong et al., 2011). In addition, past research has identified individual and organizational factors as the antecedents of knowledge sharing. The antecedents of knowledge sharing can be identified by the following factors such as motivation to share, rewards, opportunities to share, culture and work environment (Ahmadi et al., 2012), motivation (Llopis-Corcoles, 2011), communication (Bratianu & Orzea, 2010), trust between individuals (Ahmadi et al., 2012; Hansen, Rasmussen & Bosse, 2013). A study conducted by Wahid et al. (2019) found that knowledge sharing has a positive influence on organizational performance. However, research by Ahmadi et al. (2012) in Iranian bank found that trust, reward and information technology have a significant relationship whereby the organizational culture failed to support the influence of knowledge sharing to Iranian bank.

2.4 Organizational performance

Measuring the performance of organization is very important as an indicator to achieve organization effectiveness. The literature on organizational performance shows that there is no single universal measure or common framework that can be used to assess overall organizational performance (Alkalha, Al-Zu'bi, Al-Dmour, Alshurideh & Masa'deh, 2012). Similarly, Alkalha et al. (2012) mentioned that it is difficult to measure organizational performance especially because what is measured changes continually.

Antony and Bhattachatyya (2010) proposed organizational performance a construct that can be used to evaluate and assess the successfulness of organization to create and deliver values to its external and internal stakeholders. As the literature goes, many scholars and practitioners agree that organizational performance can be used as an indicator to evaluate how well an organization achieves its objectives and to assess the efficiency and effectiveness

of goal achievement (Al-Dhaafri et al., 2013). Venkatraman and Ramunajan (1986) argued that organizational performance is an indicator, which can measure how well an enterprise achieves its own objectives. Those indicators are sale growth, company return on investment (ROI), company return on assets (ROA), market share, new product introduction and product quality. This study has adapted measurement of organizational performance developed by Venkatrman and Ramunajan (1986).

The above discussion shows that there is a relationship between customer knowledge, knowledge sharing and the organizational performance. Hence, the hypotheses are as follows:

- H1: Customer knowledge (CK) has positively influenced market knowledge management system (MKMS).
- H2: Competitor knowledge (COK) has positively influenced market knowledge management system (MKMS)
- H3: Supplier knowledge (SK) has positively influenced market knowledge management system (MKMS)
- H4: Market knowledge management system (MKMS) positively affects market knowledge sharing (MKS)
- H5: Market knowledge sharing (MKS) positively affects organizational performance (OP)
- H6: Market knowledge management system (MKMS) and market knowledge sharing mediate between market knowledge (MK) and organizational performance (OP).

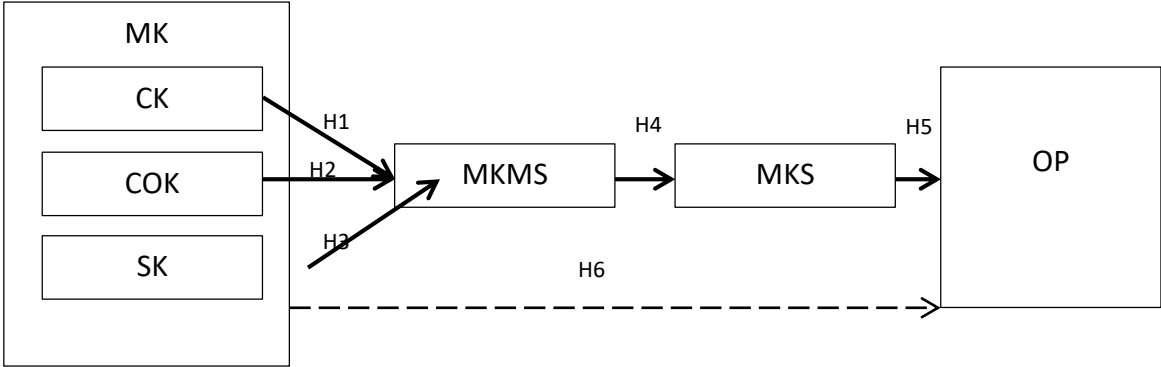


Figure 1: Research framework

3 Research Methodology

This study utilized survey research. The questionnaires were used to collect data. A corresponding 5 Likert scale was deployed (1 for “Strongly Disagree”; 2 for “Disagree”; 3 for “Neither Agree nor Disagree”; 4 for “Agree” and 5 for “Strongly Agree”). Prior to pilot testing and main data collection, the questionnaires were pre-tested with several experts in the field and also several insurance companies who could become the prospective respondents. The questionnaires were pilot tested with 30 insurance companies. Using the SmartPLS, the responses of these 30 companies were analyzed for assessing the reliability of the measurements. The recorded Cronbach Alpha for all variables employing multi-items

estimated range from 0.65 – 0.88 which suggests that the questionnaires were reliable (Kline, 2011).

The populations of the study were 416 Malaysian insurance companies listed in the National Innovation Agency of Thailand (NIA). There were 215 companies responded. However, only 209 questionnaires were valid for the data analysis. The remaining 209 were analyzed using Partial Least Square (SmartPLS version 3). This study will first develop and assess the measurement model and followed by the development and assessment of the structural model.

Previous studies have indicated a sample threshold of as little as 100 samples for PLS-SEM (Reinartz, Haenlein, and Henseler 2009). Alternatively, one can revert to the more restrictive minimum sample size recommended based on statistical power (Hair, Hult, Ringle & Sarstedt, 2014). We used G*Power to calculate the sample size based on statistical power (Faul, Erdfelder, Buchner and Lang, 2009), suggesting that we needed a sample size of 138 for a statistical power of 0.95 for model testing. Since, our sample size exceeded 138, the power value in this study also exceeded 0.95. Moreover, the minimum power required in social and behavioural science research is typically 0.8. Therefore, in both cases, we can conclude that our sample size was acceptable for the purposes of this study.

4 Discussion

The respondents of the study were 209 Thai SMEs, the categories of companies consisted of 44.50% was eco-industry, 34.45% was design & solution and 21.05% was bio-technology. Most of the respondents were from central zone which was 74.16% followed from the south 8.61% and 7.18% was from the northeast and the north (6.70%). Most of the respondents (58.85%) were small companies which have less than 50 employees.

4.1 Common method variance (CMV)

Due to the self-reported nature of the data, there was a potential for common method variance (CMV), and so the Harman one-factor test was conducted to determine the extent of this. According to Podsakoff and Organ (1986), common method bias is problematic if a single latent factor would account for the majority of the explained variance. The un-rotated factor analysis showed that the first factor accounted for only 26% of the total 74% variance, and thus the common method bias was not a serious threat in the study.

4.2 Measurement model

To examine the research model Partial Least Square (PLS) analysis technique was employed by using the SmartPLS 3 software version 3.2.8 (Ringle, Wende & Becker, 2015). In an effort to refine all structural equation models two stage analytical procedure was employed, where researchers tested the measurement model and structural model recommended by Hair, Sarstedt, Hopkins & Kuppelwieser (2014). Prior to structural modelling, the study has to assess

the measurement model of latent construct for their dimensionality, validity, and reliability. Cronbach's (α) and composite reliability were also tested as recommended by Henseler, Ringle & Sarstedt (2015).

The measurement model used in this study included five constructs: customer knowledge (CK), competitor knowledge (CoK), supplier knowledge (SK), market knowledge management system (MKMS), market knowledge sharing (MKS) and organizational performance (OP). In assessing a model's reliability, the loading of each indicator on its associated latent variable must be calculated and compared to a threshold. Generally, the loading should be higher than 0.7 for indicator reliability to be considered acceptable (Hair, Hult, Ringle, and Sarstedt, 2014). A loading lower than 0.4 indicates that an item should be considered for removal, and items with a loading of 0.4–0.7 should be considered for removal if they increase the composite reliability (CR) and Average Variance Extracted (AVE) above the threshold (Hair, Hult, Ringle, and Sarstedt, 2014). Table 1 indicates that most of the indicator loadings on their corresponding latent variables for the respondents were higher than 0.7.

4.3 Validity assessment

Validity was assessed in terms of convergent validity and discriminant validity. Convergent validity is the extent to which the scale correlates positively with other measures of the same constructs (Malhotra, 2002). Convergent validity of measurement model is usually ascertained by examining the factor loading, average variance extracted (AVE) and composite reliability (CR) (Hair, Black, Babin, Anderson & Tatham, 2010). All the values were above 0.6, shows the convergent validity of the model. Convergent validity can be evaluated by examining the loading (≥ 0.6), $AVE \geq 0.5$, and $CR \geq 0.7$ (Kim, 2010). Each item's coefficients on its underlying construct were observed. A test of each item's coefficient was used to assess convergent validity. All values fulfil the required standard, indicating high convergence validity. Table 1 shows the results of factor loadings threshold level of 0.7 as recommended by Hair et al. (2010).

Table 1: Factor loading, C.R. and AVE

Constructs	Loading	Beta	C.R.	AVE
SK	0.807	0.807	0.872	0.631
OP	0.819	0.819	0.871	0.576
MKMS	0.838	0.838	0.889	0.666
MKS	0.878	0.878	0.924	0.803
COK	0.866	0.866	0.902	0.650
CK	0.799	0.799	0.882	0.713

Besides assessing the convergent validity, the study also evaluated the discriminant validity. Discriminant validity can be evaluated by examining Fornell-Larcker Criterion (Fornell & Larcker, 1981) and Heterotrait-Monotrait Ratio (HTMT) (Henseler, Ringle & Sarstedt, 2015). Fornell and Larcker (1981) have suggested examining whether the square root of the AVE for each construct is greater than the correlation between the constructs. There are two ways of

using HTMT to assess discriminant validity: (1) as a criterion or (2) as a statistical test. First, using HTMT as a criterion involves comparing it to a predefined threshold. If the value of HTMT is higher than this threshold, one can conclude that there is a lack of discriminant validity. Some authors suggest a threshold of 0.85 (Kline, 2011), whereas others propose a value of 0.90 (Gold, Malhotra & Segars, 2011). Table 2 and table 3 show the results of the discriminant validity assessment of the measurement model using the Fornell–Larcker criterion and HTMT ratio and indicate that the models possess acceptable discriminant validity.

Table 2: Fornell and Larcker

Constructs	CK	COK	MKS	MKMS	OP	SK
CK	0.845					
COK	0.503	0.806				
MKS	0.184	0.287	0.896			
MKMS	0.448	0.415	0.247	0.816		
OP	0.221	0.278	0.589	0.158	0.759	
SK	0.602	0.450	0.205	0.435	0.220	0.794

Table 3: Heterotrait-Monotrait Ratio (HTMT)

	CK	COK	KS	MKMS	OP	SK
CK						
COK	0.596					
KS	0.206	0.317				
MKMS	0.508	0.453	0.263			
OP	0.267	0.337	0.652	0.186		
SK	0.735	0.534	0.258	0.492	0.268	

4.4 Structural Model

We performed bootstrapping involved 5000 samples whilst our actual sample stood at 209. The SEM results are presented in Table 4 and Table 5. It can be observed that R^2 values for MKMS is 0.276, suggesting that 27.6% of the variance in MKMS is explained by the customer knowledge (CK), competitor knowledge (CoK), and supplier knowledge (SK). The MKMS construct in turn contributes to 6.1% of the variance in market knowledge sharing (MKS) based on the R^2 values of 0.061. Meanwhile MKS contributes to 34.7% of the variance in organizational performance (OP). Table 4 shows that all beta path coefficients were positive and in the expected direction and were statistically significant. To elaborate the significant effect of customer knowledge (CK) ($\beta = 0.214, p < 0.05$), competitor knowledge (CoK) ($\beta = 0.211, p < 0.05$), supplier knowledge (SK) ($\beta = 0.213, p < 0.05$), market knowledge management system (MKMS) ($\beta = 0.274, p < 0.05$) and market knowledge sharing (MKS) ($\beta = 0.589, p < 0.05$). Thus H1, H2, H3, H4 and H5 are supported but H2 is not supported. The result also reveals that market knowledge sharing (MKS) has a high impact, 34.7%, on organizational performance.

Table 4: Path coefficient and hypotheses testing (Direct Effect)

Hypotheses	R ²	Beta	S.D.	T Value	Decision	VIF	Q ²
H1:CK->MKMS	0.276	0.214	0.113	1.901	supported	1.756	0.037
H2:COK->MKMS		0.211	0.116	1.842	supported	1.402	
H3:SK->MKMS		0.213	0.105	2.015	supported	1.644	
H4:MKMS->MKS	0.061	0.247	0.104	2.372	supported	1.000	0.147
H5:MKS->OP	0.347	0.589	0.063	9.320	supported	1.000	0.171

Table 5: Indirect Effect

Path	Beta	S.D.	T Values	Decision
CK->MKMS->MKS	0.053	0.037	1.442	Not supported
COK->MKMS->MKS	0.053	0.040	1.313	Not supported
SK->MKMS->MKS	0.052	0.035	1.485	Not supported
CK->MKMS->KS->OP	0.031	0.022	1.397	Not supported
COK->MKMS->KS->OP	0.031	0.024	1.276	Not supported
SK->MKMS->KS->OP	0.031	0.022	1.381	Not supported
MKMS -> MKS -> OP	0.146	0.069	2.113	Supported

To test indirect effect, we employed Preacher and Hayes (2008) bootstrapping method. First we tested the indirect effect of CK, CoK and SK on MKS. The bootstrapping analysis revealed that the indirect effect of $\beta=0.053$ with t values of 1.442, $\beta=0.053$ with t values of 1.313 and $\beta=0.052$ with t values of 1.485 respectively (Table 5). We found that there is not a mediating effect of MKMS between market knowledge and market knowledge sharing (MKS) given that the indirect effects with t values less than 1.645. Based on the above result we can conclude that the mediation effect of MKMS and MKS on the relationship between market knowledge (MK) and OP is statistically insignificant. Thus, H5 is unsupported. However, market knowledge sharing has a mediating effect between market knowledge management system (MKMS) and organizational performance (OP).

We evaluated for multicollinearity among the variables in our model, and did not find any cause for concern using the criteria of variance inflation factor (VIF), which were (Table 4) all below the suggested value of 5.00 (Hair et al., 2014). Finally, we also assessed the predictive relevance of the model through the blindfolding procedure (Table 4) as suggested by Hair et al. (2014). The Q^2 values for market knowledge sharing (MKS) ($Q^2 = 0.037$), market knowledge management system (MKMS) ($Q^2 = 0.147$) and organizational performance (OP) ($Q^2 = 0.171$) are > 0 , suggesting that the model has sufficient predictive relevance.

5 Conclusion

The study found that market knowledge sharing becomes an important factor to organizational performance. Knowledge sharing practices are extremely important in keeping and enhancing gained valuable intellectual capital and therefore organizational success. Hence, the identification of influencing factors and the outcomes of these practices is necessary. Information technology is an important factor for establishing a knowledge sharing platform. Supportive technical environment increases the collaboration among the people (O'Dell, Hubert, 2011). Knowledge Management Systems (KMS) (a type of information systems) are supportive technologic knowledge sharing instruments. A flexible corporate infrastructure is necessary for enterprise based knowledge management systems for instant, ad hoc and intensive collaborations (Liu et al, 2005). Furthermore, KMS is recommended as an enabler for KMS use in increasing knowledge sharing.

The result from the Importance-Performance Matrix Analysis (IPMA) shows that market knowledge sharing has high importance and high performance compared to market knowledge management system and market knowledge. The finding of this study is supported by the research conducted by Wang and Noe (2010) in which knowledge sharing is suggested as a fundamental knowledge centered activity through which employees can mutually exchange their knowledge and contribute to knowledge application and ultimately the competitive advantage of the organization.

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Learning Assistance Systems in Smart Factories Industry 4.0

Applying Job-Know Ontology towards Linking Workforce Experience and Labor Productivity in Smart Factory Industry 4.0

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Abstract: Industrialization of Artificial Intelligence (AI) raises several questions, inter alia, whether machines can gain work experience alike human workforce, whether the on-the-job obtained experiences may enrich existing knowledge, skills and abilities (KSCs) and untimely lead to improve its productivity. If so, human- and machine workforce initiate a new competition in the era of intelligentization where not only AI-enhanced and smart machines reproduce human cognitive and physical capabilities, but also they may challenge the unique role of human as a learner. Despite economic, ethical and societal challenges, intelligentization undergoes rapid changes in the manufacturing enterprises. This paper explores the linkage between gaining workforce experience and labor productivity in hybrid man-machine settings. The ultimate goal, partially addressed in this paper, is to anticipate the learning trajectory of human and machine workforce and thus recommend the new division of labors and innovate new processes and products in smart factories.

Keywords: Ontology, Task, Learning, Labor Productivity, Division of labor, Smart Factory

1 Introduction

In manufacturing enterprises 4.0, the shift in the division of labor between human and machine is anticipatable (World Economic Forum, 2018). As machines may take over part of the tasks of today, especially routine manual and/or cognitive tasks, employees should perform emerging tasks, in particular, non-routine manual and/or cognitive tasks. Depending on job roles, a human workforce may either i) interact with machine workforce, including smart machinery and devices, artificial intelligence (AI) systems, collaborative robots (cobots) or learning assistance systems, or ii) collaborate with other professionals in diverse qualification levels, including operators, administrative personnel, engineers and/or managers. Involving in structured processes, which consist of a set of sequential, pooled, reciprocal or shared tasks requires a) identifying the job tasks defined as a part of the job description by the employers, and b) specifying the knowledge, skills, and competences (KSCs) demanded to perform the job tasks.

Learning has been understood as part of human intelligence and in fact, human rights e.g. to learn how to perform a specific job. Educational institutions, particularly vocational education and training (VET), support learners (i.e. potential job seekers) to acquire the required KSCs

demanded by the world of work (WoW), i.e. a specific job. Moreover, job seekers and/or jobholders improve the level of KSCs and fill the KSCs gap either by participating in off-the-job-training programs or doing the tasks and gaining experiences on-the-job, respectively (Khobreh et al., 2016). In both cases, job seekers/jobholders as lifelong learners reinforce their body of knowledge, i.e. the required KSCs, towards career development as a lifelong learning process. In this continuous training process, there is a basis of KSCs, which jobholders possessed in educational institutions. Nevertheless, they maintain, enrich and sustain the KSCs level by gaining experiences. In fact, there is a direct relationship between i) what KSCs possessed by learners and ultimately represented by jobholders and ii) what KSCs required to fulfill expected degrees of employee's on-the-job performance. If what is supplied and what is demanded are not in a state of equilibrium then the actors (i.e. jobholders and employers) faces with KSCs imbalance, performance problem and ultimately job dissatisfaction. To define the KSCs imbalance problem, first the tasks should be identified, second, the required KSCs should be recognized and finally, KSCs represented by the job-seeker/holder should be compared with what is demanded. Considering experience-driven processes at the heart of a job, the jobholders obtain individual-based KSCs by doing the tasks, collecting experiences and fulfilling the assigned tasks competently, i.e. KSCs imbalance problem is tackled. This sort of KSCs is reinforced by experiences collected over time.

Furthermore, the relation between labor productivity and labor experience has long been the subject of scientific investigation. The undergoing digitalization and intelligentization in manufacturing enterprises raise several questions about the new division of labor and its impact on organizational learning and labor productivity (Ansari, 2019). The main reason is the intelligentization of machines, processes, and products. In other words, beside human as a learner and knowledge actor, intelligent machines and AI systems emerge a new group of learnable workforce (cf. definition of Knowledge Actor 4.0 in (Ansari, 2019)). Approaching the aforementioned challenges from the angle of Task-KSC supply and demand, the key questions of this paper are as follows: What will be the effect of workforce experience and learning on labor productivity? How to monitor the evolution of human- and machine-specific KSCs in smart factories? And, how to provide recommendations (strategies and measures) to anticipatively control the evolution of KSCs linked to the variable division of labors?

In earlier works, the Job-Know Ontology, an ontological model of WoW and WoE, has been developed, which represents the relation between the tasks that construct a job and the required KSCs. It supports reasoning out (im)balance state of supply-demand. The methodology of developing "Job-Know Ontology" has been elaborated in (Khobreh et al., 2016). This paper presents the initial steps towards adopting the "Job-Know Ontology" in smart factories. To this end, Job-Know Ontology is used which dynamically collects human- and machine-specific experiences during performing a job in smart factories. In particular, the Job-Know Ontology establishes the knowledge-base, i.e. the semantic representation of task- and KSC elements, including the job tasks, required KSCs demanded, and learning lessons/experiences, which are qualifiers and enablers of the job tasks. It provides set of rules to reason out what is needed and what is missed in the supply-demand chain of learning and performing. Besides, this paper lays the ground for extending the scope of the ontology into an "experience-driven Job-Know Ontology" in which lessons learned are used to tackle the imbalance problem and improve labor productivity, including both human and machine workforce. In so doing, the Job Knowledge Experience Engine (eXeN) and the Job Knowledge Recommendation System (RecoSys) are proposed.

The rest of the paper is structured as follows: Section 2 discusses the background of the research including a detail discussion on learning curve and productivity. Section 3 elaborates the Job-Know Ontology and presents the KSCs imbalance states. Section 4 introduces Job Knowledge Experience Engine (eXeN) and Job Knowledge Recommendation System (RecoSys), which provides new learning items from collected experiences and recommends appropriate learning items for further learning and training, respectively. Section 5 concludes the study by summarization and discussion.

2 Background

2.1 Why Measuring Learning Effectiveness Matters in Smart Factories?

In conventional factories, a safety zone or a physical/virtual (un-)fixed fence distinguishes human- and machine-specific workplace. The emergence of cobots introduces human-machine collaboration and sharing workplace (Sylla and Satwick, 2017). AI agents, intelligent and learnable software and robot systems fulfill a certain degree of autonomy, where they reproduce humankind of physical and cognitive capabilities (Ansari, et al, 2018a). Hence, the new division of labor between human and machine workforce is anticipatable, in which three types of tasks can be introduced namely human tasks for humans, machine tasks for machines, and shared tasks for both human and machine workforce. As depicted in Figure 1, the entire pool of tasks is, therefore, divided into three partitions, whereas today two partitions (Ansari, Erol, and Sihn, 2018).

Let us assume that “Learnability” and “Learning Effectiveness” in performing tasks are determinants of “Labor Productivity”. In case of human- or machine-specific tasks, monitoring individual learning curves (LCs) may provide valuable information with regard to an optimal division of labor. LCs of human and machine can cross, with the result that the advantage of the alternatives “Human or machine” depends on the planned order volume. For investment decisions on cobots and AI systems, the question whether the target tasks should be performed by man or by a machine must be answered based on estimating the correlation between labor productivity and the total costs or expenditures for both labor alternatives during the working life of human and machine workforce. LCs provide a good basis for forecasting the effect on productivity.

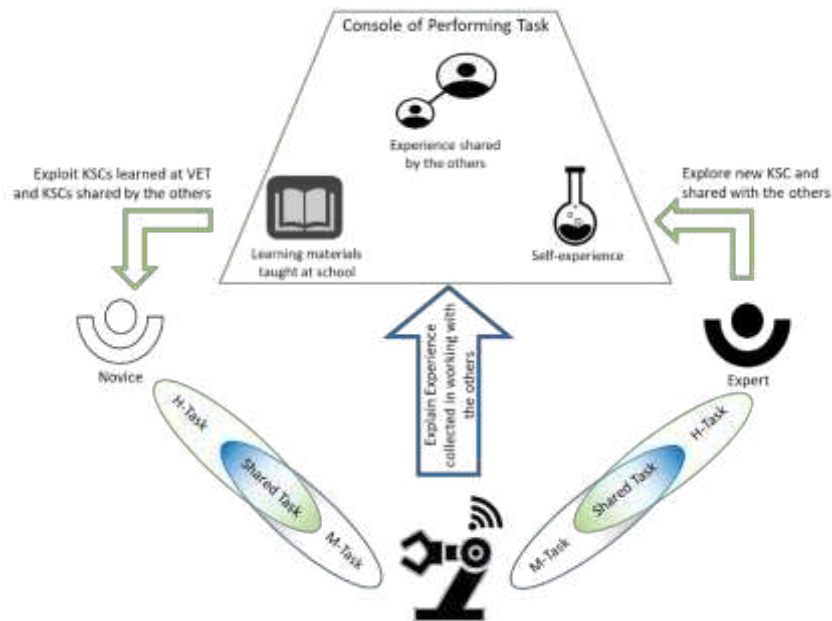


Figure 4 Labor Productivity, Sharing Workplace and Workforce Experience in Smart Factories

In case of the shared task, segmentation of a task into sub-task might be a way to distinguish human and machine profiles and sketch related LCs. LCs of both can be used to evaluate different configurations. For example, if alternatives are available for the system design of Digital Assistance Systems (DAS), their dynamic behavior can be evaluated using LCs. The parameters Handling/Operation Time, Human Error Probability and Learning Time discussed by Ansari, Hold, Sihn (2018) are suitable for this purpose. As a scientific challenge, still investigation is required to identify a target function for measuring learning effectiveness associated with productivity in the shared workplace under boundary conditions such as safety, privacy, scalability, and complexity with regard to product, processes, operations and tasks (Ansari, et al., 2018b).

2.2 Learning and Labor Productivity

2.2.1 Definition and Measurement of Labor Productivity

Productivity is generally seen as an input-output ratio of quantitative variables. The numerator of such a quotient, i.e. the productivity key figure, contains the product quantity generated (measured in pieces, weight units, etc.) and the denominator contains the quantity of a production factor required for that output. Labor productivity P_L can thus be defined that the quantity q of produced parts or end products is set in relation to the working time t_L (in hours) required for q (Blohm et al., 2016):

$$P_L = q/t_L \quad (1)$$

To reflect a change in labor productivity, the reciprocal P_L^{-1} of this key figure is also used. For example, the improvement in efficiency can be expressed in the assembly of a particular type of car by showing the reduction in the number of required working hours per vehicle. So that labor productivity at a certain point in time and its development over time can be meaningfully interpreted, it should be noted that both, output and input, are homogeneous goods each, i.e. they should be of the same quality. Otherwise, an addition of the output or input quantities would not be possible. If, on the other hand, the output is qualitatively different, but at least

similar, and if it is also known in what ratio the n different products differ in terms of labor input, then the qualitatively different outputs q_i ($i = 1, \dots, n$) can be summarized additively by using standardization factors g_i in the form of a weighted arithmetic mean:

$$q = \sum_{i=1}^n g_i \cdot q_i \quad (2)$$

In this equation, q denotes the output in calculation units. The standardization factors represent the reduced expenditure ($g_i < 1$) or additional expenditure ($g_i > 1$) of working time compared to a standard product ($g_i = 1$). The standard product does not have to exist in reality but can be a fictitious operand. Let us assume that the three products are manufactured. Product 1 requires 95 % of the working time of the standard product (= product 2) per unit, while product 3 requires 110 %. The production quantities in an accounting period are $q_1 = 3000$ units, $q_2 = 5000$ units and $q_3 = 4000$ units. The output q is then 12,250 calculation units. If a total of $t_L = 10000$ working time units was utilized for all products, the labor productivity is $P_L = 12.25$ calculation units per time unit.

The method of productivity calculation by means of a standard product can be applied without great effort in case of traditional mass and large series production. The domain of the Smart Factory, however, is the production of more differentiated products (i.e. Lot Size One), so that the more heterogeneous the production program, the more time-consuming the procedure will become.

If (very) different labor qualifications are involved in the manufacturing of a product, the condition of homogeneity of the input is not met in order to determine labor productivity. In this case, a procedure analogous to that described above with standardization factors h_j with $j = 1, \dots, m$ is recommended for the survey of the total required working time t_L , where m denotes the number of qualification levels to be taken into account. Starting from a "reference qualification" which receives the factor $h_j = 1$, the required working hours t_{Lj} of the individual qualification levels are multiplied by a normalization factor $h_j < 1$ if the qualification is below the reference qualification or, conversely, by a factor $h_j > 1$. As a pragmatic solution to the problem of quantifying these standardization factors, it is proposed that the factors be determined in relation to the compensation paid to the employees. In this way, for the total working time required, the following result is obtained

$$t_L = \sum_{j=1}^m h_j \cdot t_{Lj} \quad (3)$$

and for the labor productivity

$$P_L = \frac{\sum_{i=1}^n g_i \cdot q_i}{\sum_{j=1}^m h_j \cdot t_{Lj}} \quad (4)$$

When interpreting labor productivity in an isolated way, it should be noted that the influence of the other production factors (machines, materials, planning, and management) must not be neglected (Blohm et al., 2016). The output always results from the combination of all production factors involved. For example, an increase in labor productivity can be based on the use of more efficient machinery, easier to handle components, improved work instructions or several influencing factors that are working simultaneously. Therefore, an observed increase in labor productivity does not necessarily or solely result from an increase

in the efficiency of labor. This is particularly relevant when considering larger periods of time in which production processes, including factor input ratios, have been changed.

For reasons of simplification, the following explanations are confined on one product ($n = 1$) and one work qualification ($m = 1$), so that the indexing of the variables q and t_L is no longer required. In the following, t is set for t_L as well.

2.2.2 Learning Curves as a Linkage between Workforce Experience and Labor Productivity

The fundamental contribution by Wright (1936), which is still frequently cited today, is based on empirical data from the aircraft industry since the early 1920s. Wright's finding of the relationship can be expressed by the following equation:

$$t(x) = t_1 \cdot x^{-b} \tag{5}$$

In the above equation of LC, x is the cumulated product quantity and $t_1 = t(x = 1)$ is the required working time for the first quantity unit. b is the learning coefficient, a non-dimensional parameter to be determined empirically, which represents the learning success. $t(x)$ denotes either the working hours required for the x^{th} output unit (unit cost model) or the average cumulated working time per output unit for the production of x units (average cost model) (Badiru, 1992). The term "cost model" derives from the fact that cost can be also considered instead of production times, because under the condition of constant compensation rates per time unit (homogeneity of work input), the transition from t to cost is a pure linear transformation that does not change the basic statement, i.e. with each multiplication (e.g. doubling) of the cumulative output of a product, the required production hours of a unit or the corresponding unit cost decrease by a constant percentage. LC, a hyperbolic curve, is visualized in Fig. 2.

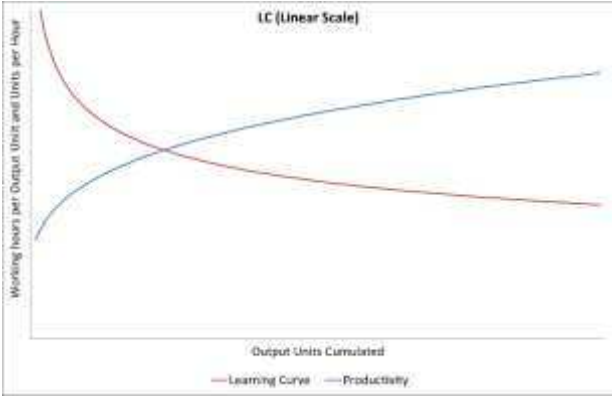


Figure 5 Learning Curve and Productivity

If we use the reciprocal value of the working hours per output unit, we obtain, as explained above, productivity. Its graph is also shown in Fig. 2 as a function of the cumulative production quantity. In this respect, the term "Curve of Natural Productivity Increase" (Keachie, 1964) for LC is equally appropriate. Another term, "experience curve", is well suited to the fact that workers are becoming more and more productive because of increasing experience, measured in terms of cumulative output. Nevertheless, this term is not very common for learning in the operative area of manufacturing and is mostly used in the sense of a cost experience curve for strategic issues (the composition of the product portfolio, product design, competitive analysis). In this case, not only the labor cost but also all payments, which

result in manufacturing the products are considered. A doubling of the product quantity produced leads to the reduced execution time as in:

$$t(2x) = t_1 \cdot 2x^{-b} \quad (6)$$

The decrease can be expressed by the ratio as in:

$$q = \frac{t(2x)}{t(x)} = \frac{t_1 \cdot 2x^{-b}}{t_1 \cdot x^{-b}} = 2^{-b} \quad (7)$$

Logarithmizing provides

$$\log q = -b \cdot \log 2 \quad (8)$$

and thus the learning coefficient

$$b = -\frac{\log q}{\log 2} \quad (9)$$

For example, for every doubling of the cumulative output quantity, the reduction in working time is 20%, then $q = 0.8$, that is, there is an 80% learning curve. The resulting learning coefficient is

$$b = -\frac{\log 0.8}{\log 2} = 0.322. \quad (9.1)$$

With double-logarithmic axes, the learning curve acquires a linear form (Fig. 3). The parameter b is a measure of the slope of the curve and reflects the fact that the learning rate is constant (log-linear model). However, it also implies that the learning effect is absolutely highest with small-cumulated quantities.

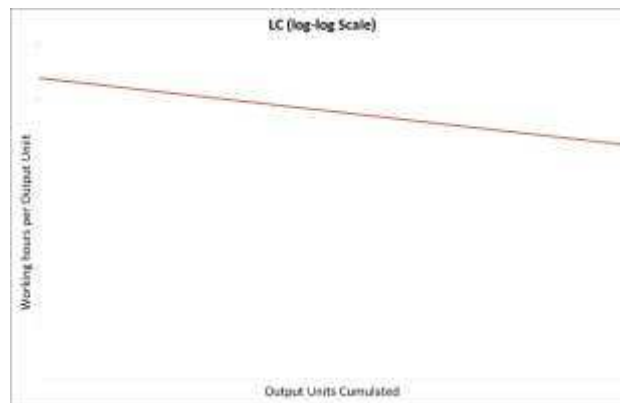


Figure 6 Learning Curve (log-log Scale)

LCs represent a statistical relationship on a "macroscopic" level, while a causal analysis must be based on the single influencing factors of the learning effect ("microscopic" level). The increase in productivity of working people is certainly largely due to the exercise effects of learning by doing, i.e. the increasing routine raises the speed of work operations. Work interruptions disturb the exercise effect, so that forgetting ("de-exercising") begins. Whether and to what extent other influencing factors are effective depends on the conditions of the individual case. Anzanello and Fogliatto (2011) report on studies in which diverse factors have been investigated, as the structure of training programs, workers' motivation, prior experience with the task, and complexity of the task. Unclear work instructions and poor production planning, which leaves a high degree of freedom to the workers, increase the savings potential and steepen the learning curve. A high degree of difficulty of the work task and a small influence of the mechanical equipment on the operation times result in the same effect. In these cases, it can be assumed that not only the improvement of sensorimotor

abilities due to the repetition of work processes but also the gradual improvement of the working method by the worker, i.e. adaptations of the micro-processes through feedback (Seidenberg, 2012), lead to an increase in productivity. In other words, the same process is not only always carried out faster but is also modified in the direction of higher efficiency. Interindividual differences in learning ability (intelligence quotient, speed, sustainability, etc.) interfere with the above-mentioned external influences.

Over time, extensions and modifications of Wright's log-linear model have been developed which take into account further influencing parameters and also lead to other curves (s-shaped, transition to a plateau, etc.) (cf. the literature overviews at Badiru, 1992, Anzanello and Fogliatto, 2011, Glock et al., 2018). A plateau, i.e. a parallel to the axis of the independent variable, indicates that learning has come to a stop or saturation point, may it be that all potentials for improvement have been exhausted, may it be that the machine exerts a dominant timing influence. While the log-linear model is the most investigated LC model, exponential and hyperbolic have been discussed also.

Multivariate models consider more than one independent variable influencing workforce learning. Badiru (1992) presented a LC model with the two independent variables “cumulative production” and “cumulative training time”, which was statistically analyzed by him with the result that there was a strong (negative) correlation between the variables.

Two examples, which do not originate from industrial production, may illustrate how widely LCs can be applied. Martin et al. (2011) describe the application of LC for evaluating and improving personalized educational systems (intelligent tutoring systems). They use an error rate as a function of the number of times the test persons have had an opportunity to practice a particular knowledge component.

Notably, in machine learning, LC are used as well. As the independent variable “number of training iterations” is chosen in the artificial neural network literature and “number of training examples” in the field of general machine learning (Perlich, 2011). In the former context, the model error is investigated and in the latter the performance, for instance as a comparison of competing for modeling algorithms.

3 Job-Know Ontology represents KSCs supplied and demanded

As the jobholders pave the professional level from novice to expert (i.e. five levels is considered: novice, beginner, intermediate, competent, expert), the sort of KSCs that they represent are getting more advanced and mature and the jobholder productivity is increased. This is the result of learning and gaining experience by doing the tasks. The experiences and lessons learned, which result in increasing productivity, should be collected, documented, digitalized and shared as the learning assets.

Lack of KSCs to perform the job tasks, which should be obtained by learning and experiencing represents KSCs imbalance problem. One of the force drivers, which leads to KSCs imbalance problem is the missing link between the World of Work (WoW) and World of Education (WoE). Knowledge and experience management hand in hand with semantic technology contributes to connecting these two worlds and model a connected, integrated and compounded world. In this paper, the authors gain benefit from ontology modeling as a technique to represent the semantic relation of WoW and WoE and establishing the compounded world, so called World of Competence (WoC) as elaborated earlier in (Khobreh, 2017).

3.1 Motivating Scenarios

A jobholder has two roles in smart factories; one is performing the tasks as a worker (i.e. doer) and the other is learning the lessons and collecting experiences by doing the assigned tasks (i.e. learner). These two roles are intertwined, i.e. in a time that the jobholder is performing the task in the same time; she is obtaining the new experiences and upskill/reskill her competence level. LC shows the result of performing, learning, re-skilling/upskilling and ultimately increasing productivity.

The Job-Know Ontology is mainly initiated based on three motivating scenarios:

- Scenario I – KSCs required for performing the assigned job task are less than KSCs required.
- Scenario II – KSCs required for performing the assigned job task are more than KSCs required.
- Scenario III – KSCs required for performing the assigned job task, meet the KSCs required.

The above-mentioned scenarios define five KSCs states, i.e. gap and shortage, which address the scenario I, surplus and obsolete, which address scenario II, and balance state, which addresses the scenario III. Figure 4 illustrates the five KSCs states, their descriptions, and related scenarios.

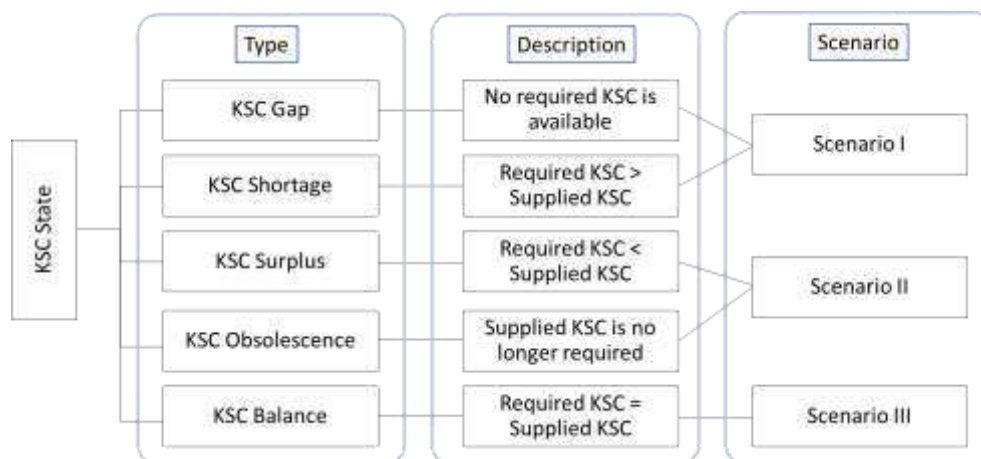


Figure 7 KSC States, Type, Description and Scenarios

The KSC gap and shortage states reveal that the pointed KSCs should be (re)learned/ (re)skilled to meet the required KSC level. In contrast, to tackle the problem of surplus and obsolete, the possessed KSCs should be “unlearned”/ forgotten. Finally, the KSC balance is the only state, where the supplied KSC meets the requirements. The balance state can be considered as the “flow” state defined by (Csikszentmihalyi, 1990), where task and KSC meet each other. This state shows that the jobholder holds sufficient KSC to perform the assigned task. So that she flows while she reskills/upskills her possessed KSCs and paves the professional levels. Therefore, she seeks for more challenging tasks.

3.2. World of Work - Demand Space

The WoW consists of jobs and tasks regardless of who should perform the job either machine or human or both. Table 1 defines the basic glossary of terms. The WoW ontology includes

five classes of Job, Task, Job Description, Job Specification, Job-KSC, which are defined in the followings.

International Labor Office (ILO) defines a job as “a set of tasks and duties performed or meant to be performed, by one person including for an employer or in self-employment” (International Labour Office, 2012). The job consists of duties, which is a collection of tasks, a task is a collection of activities, and activity is a collection of groups of elements. Finally, an element is the smallest unit of a job, which has a beginning, middle, and end (Brannick, et al., 2007). There is a difference between “job” and “role”. The role is about people and means “the part play people in their work”, while “jobs are about the tasks and duties” (Armstrong & Taylor, 2014). The focus of this study is on the job, not the role.

The job tasks are described by the job description. A job description is about the tasks rather than the outcomes of the tasks and competences required to perform the tasks (Armstrong & Taylor, 2014), (Breugh, 2017). To specify education level (qualification), experience, specific KSCs and personal characteristics, which represents the potential of being able to perform the job, job specification is defined (Brannick, et al., 2007), (Breugh, 2017).

A KSC required to perform a task should be specifiable, definable, and measurable (Allen & Pilot, 2001). Table 1 defines the glossary of the WoW domain to facilitate a common understanding of the terms. The focus of German vocational education is placed on “the ability to apply theoretical knowledge in a practical context” (Clarke & Winch, 2006). In this way, competence refers to both “professional” and “personal” competences and consequently, “professional competence” is subdivided in “knowledge” and “skill”, while “personal competence” is subdivided in “social competence” and “autonomy” (German Qualifications Framework Working Group, 2013).

Table 11 Glossary of Job-Know Ontology (Part I)

Term	Definition	Source
Job	A set of tasks and duties defined by the employer(s) and performed, or meant to be performed, by employee(s). The job is defined by job description including tasks, specified and elaborated by job specification, including KSCs.	(International Labour Office, 2012)
Task	A task is described by the job description as a statement, which should reply to three main categories of questions i) Do what? ii) To what? and iii) For what purpose?/With what?/ To whom?/What type?. The type of answers to the above-mentioned questions are i) the action (i.e. the verb), ii) the noun and iii) the noun, respectively. The verb can be categorized into the linear process (e.g. build) or a cyclic process (e.g. develop).	(Morgeson and Dierdorff, 2011), (Voskuijl, 2017), (Moore et al., 2012)
Knowledge	“Outcome of assimilation of information through learning. Knowledge is the body of facts, principles, theories, and practices related to a field of study or work”.	(European Parliament, 2008)
Skill	“Ability to apply knowledge and use know-how to complete tasks and solve problems”.	(European Parliament, 2008)

Term	Definition	Source
Competence	“Ability to use knowledge, skills, and personal, social, and/or methodological abilities, in work or study situations and in professional and personal development”.	(European Parliament, 2008)

The Job-KSC class includes all Job-KSCs, which enable jobholder to perform the assigned tasks and ultimately do the job. The property of *requires()* relates the Task class to the Job-KSC class (Khobreh, et al. 2016). The individuals/instances of the Job-KSC class are know-what (Knowledge), know-how (Skill) and know-why (Competence). To identify the dependency of a task to a Job-KSC, a demand degree (DD) is defined. DD is divided into four degrees as follows:

- Strong dependency (value 3), which defines as the sub-property of *requiresStrongly()* and identifies the task requires strongly the Job-KSC to be competently performed,
- Moderate dependency (value 2), which defines as the sub-property of *requiresModerately()* and identifies the task requires moderately the Job-KSC to be competently performed,
- Weak dependency (value 1), which defines as the sub-property of *requiresBasically ()* and identifies the task requires weakly the Job-KSC to be competently performed, and
- No dependency (value 0), which defines as the sub-property of *requiresNot()* and identifies the task does not require the Job-KSC.

Table 2 shows the classes and properties of the WoW domain.

Table 12 Classes and Properties of WoW Domain

Class	Property	Value Restriction
WoW: Job	WoW: describedBy	WoW: JobDescription
WoW: JobDescription	WoW: specifiedBy	WoW: JobSpecification
WoW: Task	owl: subClassOf	WoW: JobDescription
	WoW: requires	WoW: Job-KSC
WoW: JobSpecification	WoW: specifies	WoW: JobDescription
	owl: inverseOf	WoW: specifiedBy
	WoW: consistsOf	WoW: Job-KSC
WoW: Job-KSC	WoC: matchesWith	WoC: Knowledge
	WoC: matchesWith	WoC: Skill
	WoC: matchesWith	WoC: Competence
	owl:TransitiveProperty	WoW: matchesWith

3.3 World of Education - Supply Space

WoE is the encapsulation of learning items learned by learners to obtain learning outcomes within and/or at the end of the learning process. Focusing on intelligentization of manufacturing enterprises, two groups of learners should be considered human and machine. Human learning is a conventional process, while learning by machines and algorithms has been separately studied, known as machine learning (Ansari, Erol, and Sih, 2018). Considering a machine learning profile, three instances can be defines: i) Static Profile: Machine is preprogrammed and no further learning is possible (Conventional Machines), ii) Dynamic Profile with certain learning capacity: Machine is learnable with limited computational and storage capacity (Smart Machines), iii) Dynamic Profile with unlimited learning capacity: Machine is learnable alike human (Next generation of AI-enhanced

Machines). In the scope of this study, we mainly focus on smart and AI-enhanced machines; though today’s industry mainly deploy conventional and (semi-)smart machines.

As defined in Table 3, the WoE domain consists of two dimensions of i) Learning Item and ii) Learning Outcome. The aim of learning an Item is to obtain a specific sort of KSCs, which are consolidated as learning outcomes. Sometimes obtaining a learning outcome completely occurs not only by learning one item but also various sort of learning items are needed to be learned. In other words, each learning item may qualify learners to obtain a sort of learning outcomes, and gradually to reach the required learning outcomes for the field at the end of the learning process. The Learning Item is divided into the lesson learned at educational institutions and experience gain by doing the tasks on the job.

Table 13 Glossary of Job-Know Ontology (Part II)

Term	Definition	Source
Learning Item	The component of a qualification, consisting of a coherent set of knowledge, skills, and competences called learning outcome that can be assessed and validated.	(Cedefop 2008)
Learning Outcome	“What a learner knows, understands and is able to do on completion of a learning process”, which is defined in terms of knowledge, skills, and competence.	(European Commission 2010)

The WoE ontology includes Learning, LearningItem, and LearningOutcome classes. The property of *qualifiesToObtain()* relates the LearningItem class to the LearningOutcome class (Khobreh, et al. 2016). This super-property is distinguished to four sub-properties valued by Supply Degree (SD) value. The SD is defined to identify how much one learning item i.e. as an individual/instance can potentially qualify learners to obtain one specific learning outcome. The SD is distinguished into four degrees as follows:

- Strong dependency (value 3), which defines the sub-property of *qualifiesToObtain-Advance()*, and identifies that the learning item qualifies ones to obtain the learning outcome in an advance level.
- Intermediate dependency (value 2), which defines the sub-property of *qualifiesToObtain-Intermediate()*, and identifies that the learning item qualifies ones to obtain the learning outcome in a moderate level.
- Weak dependency (value 1), which defines the sub-property of *qualifiesToObtain-Basic()* and identifies that the learning item qualifies ones to obtain the learning outcome in a basic level.
- No dependency (value 0), which defines the sub-property of *qualifiesToObtain-Not()* and identifies that the learning item does not qualify ones to obtain the learning outcome.

Table 4 illustrates the classes and properties of WoE domain.

Table 14 Classes and Properties of WoE Domain

Class	Property	Value Restriction
WoE: LearningItem	owl: subclassOf	WoE: Learning
	WoE: qualifiesToObtain	WoE: LearningOutcome
WoE: LearningOutcome	owl: subclassOf	WoE: Learning
	WoC: matchesWith	WoC: Knowledge

	WoC: matchesWith	WoC: Skill
	WoC: matchesWith	WoC: Competence
	WoE: qualifiedThrough	WoE: LearningItem

3.4 World of Competence - Matching Space

In WoW, the Job-KSCs demanded to perform a job are specified by the job specification. In WoE, the KSCs supplied through learning are recognized as learning outcomes. In this way, the KSC is the melting point of WoW and WoE, which connects and depends on these two worlds together. WoC facilitates the process of analyzing whether or not supplied KSCs and required KSCs are in balance.

The WoC is a space where the Job-KSC from WoW and Learning Outcome from WoE are matched with Knowledge, Skill, and Competences and provide an opportunity to infer how much the supplied KSC meets the requirement. As depicted in Table 5, WoC mainly consists of three classes of Knowledge, Skill, and Competence, which are related to the WoW and WoE via two properties of WoW: *enablesToPerform()* and WoE: *qualifiedThrough()*.

Table 15 Classes and Properties of WoC Domain

Class	Property	Value Restriction
WoC: Knowledge	WoW: enablesToPerform	WoW: Task
	WoE: qualifiedThrough	WoE: LearningItem
	WoC: matchesWith	WoW: Job-KSC
	WoC: matchesWith	WoE: LearningOutcome
WoC: Skill	WoW: enablesToPerform	WoW: Task
	WoE: qualifiedThrough	WoE: LearningItem
	WoC: matchesWith	WoW: Job-KSC
	WoC: matchesWith	WoE: LearningOutcome
WoC: Competence	WoW: enablesToPerform	WoW: Task
	WoE: qualifiedThrough	WoE: LearningItem
	WoC: matchesWith	WoW: Job-KSC
	WoC: matchesWith	WoE: LearningOutcome

The five classes of Gap, Shortage, Balance, Obsolete and Surplus states are inferred by applying the logical conjunction of *WoW: requires()* and *WoE: qualifiesToObtain()* as follows:

$$isQualifiedEnablerFor(li, t) \equiv requires(t, ksc) \wedge qualifiesToObtain(li, ksc)$$

4 Job Knowledge Experience Engine and Recommendation System

As Figure 5 illustrates to tackle Gap and Shortage states, experiences are required. Therefore, (re)learning, reskilling and upskilling should occur. In contrast, responding to the Surplus and Obsolete states, the previously stored lessons learned should be unlearned and forgotten. The ideal state, which a human or machine workforce can flow there, is the Balance state. Workforces are gaining experiences by doing their tasks. LC shows the result of gaining experiences, reskilling/upskilling and increasing productivity. Right box illustrates Job-Know eXeN, which provides Learning Items and Learning Outcomes out of Experiences. The boxes in the middle are included in the bottom box, which represents WoW and WoE, the middle box shows KSC states and the top box shows, (re)learning, reskilling, upskilling, unlearning trajectory through gaining experience. Left box illustrates the Job-Know RecoSys, which provides a recommendation to tackle KSC imbalance states.

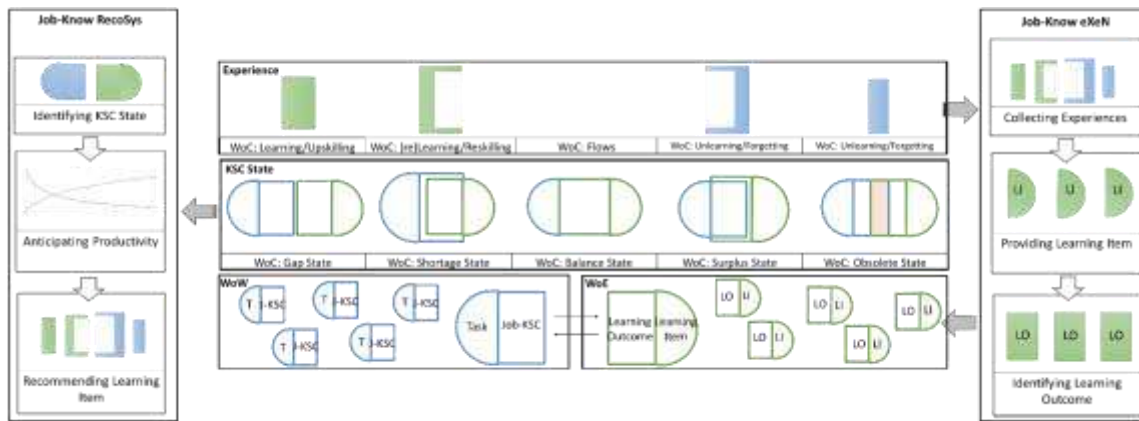


Figure 8 Job-Know eXeN and Job-Know RecoSys

The Job Knowledge Experience Engine (Job-Know eXeN) collects experiences gained through doing the tasks, provides learning items out of them and identifies the learning outcomes of the collected experiences. Thus, Job-Know eXeN provides lessons out of the collected experiences to tackle KSC imbalance problem.

Moreover, the KSC states are the input of the Job Knowledge Recommendation System (Job-Know RecoSys), which anticipates workforce LC and ultimately productivity. Job-Know RecoSys provides prescriptions including strategies and measures for workforces to improve their KSCs level by (re)learning, reskilling and upskilling based on appropriate learning items including the collected experiences. In addition, Job-Know RecoSys recommends lessons to unlearn and forget the KSCs, which are surplus or obsolete. Job-Know eXeN and Job-Know RecoSys are two systems, which utilize the Job-Know ontology as their knowledge-base and reasoning engine.

5 Discussion and Conclusion

While comparatively stable work tasks and thus long-lasting LCs characterize conventional manufacturing, frequently changing work tasks and labor division (job roles) dominate in manufacturing enterprise of the future, i.e. smart factories. As a result of the undergoing change in workplace; rapid trajectory of LCs linked to greater flexibility and higher agility of the workers is required. This increases the importance of initial and continual VET, on the one side, and on the other requires acquiring new/emerging KSCs to reduce reaction times and adaptation speed, and ultimately maintain or increase productivity.

In addition, the scope of tasks to be mastered by the workers increases (Ionescu, Schlund, Schmidbauer, 2019). Changing work tasks lead to LCs starting new each time, with the advantage that the steeper initial phases of the LCs, where the learning effect is absolutely at its highest, can be used more frequently. On the one hand, “less learning opportunities with respect to routine processes exist for human operators” (Ionescu, Schlund, Schmidbauer, 2019). The better the training of the workers before starting work, the further down (at lower initial values for the required working time or the corresponding costs) the LC begins. On the other hand, the LC is expected to be flatter. This results in a trade-off between VET and learning by doing.

Conventional machines do not have a LC. Intelligent machines like cobots are data-driven and may provide data to generate LCs. If technological obsolescence or other reasons require a

new machine investment, it must be possible to transfer the acquired know-how from the old to the new machine (i.e. machine to machine generation knowledge transfer). In this way, “forgetting” what happens when there is a change of personnel is prevented (Ansari, 2019).

The KSC states inferred by Job-Know ontology correlates with workforce’ LCs. When the inferred KSC is in an imbalance state, i.e. gap/shortage/surplus/obsolete then the LC stop and jobholder needs training/ experiencing until the LC runs again and productivity increases. In so doing, eXeN collects experiences and provides learning items out of them and RecoSys analyzes the KSC states and anticipates LC and productivity, and recommends learning items for further learning and training and tackling KSC imbalance states. In this way, the curve of learning is anticipatable.

In future research, the authors will discuss the functions of eXeN and RecoSys in details and present how eXeN and RecoSys use Job-Know Ontology as their knowledge-base and also update it.

The contribution of this approach in increasing learning effectiveness will be measured along with a certain job title, e.g. maintenance operator and engineer of today and future. Finally yet importantly, it should be verified to what extent increasing learning effectiveness will affect labor productivity under certain boundary conditions in a shared workplace.

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Competence-oriented configuration of learning factory modules for Industrie

4.0

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Abstract: Many international manufacturing companies implement modern information and communication technologies in their production environment to stay competitive in the global competition. Federal high-tech strategies promote companies that integrate various technologies. Representative examples are "Industrie 4.0 (I4.0)" (Bundesregierung 2015) in Germany or "Made in China 2025" in China. I4.0-technologies lead to new opportunities for future challenges. One of these opportunities is the increasing number of product variants up to lot sizes of "1". The production of individual products increases the complexity of production processes. According to this, employees in manufacturing companies face higher requirements. For handling these requirements, new competencies are needed. Therefore, the development of these competencies plays a crucial role. Learning factories offer realistic environments to develop these competencies effectively (Abele et al. 2017).

The aim of the research project CaMPuS is to develop a physical learning and innovation environment for competency development in China. In order to optimize production processes – by using I4.0-technologies – the competencies of Chinese engineers and managers are analyzed. The project focuses on three identified I4.0-technologies: component traceability, worker assistance and cloud services. A basic prerequisite for digitized production is component traceability which enables all data and information in production to be linked to the corresponding component (Olsen and Borit 2013). Based on this, digital worker assistance systems offer many advantages, as they are individually adaptable, real-time capable and location-based. Furthermore worker assistance systems support manufacturing or assembly processes and supply workers with the required information in a targeted manner (Apt et al. 2018). This provides employees with individual support and enables them to avoid errors, such as during the assembly process. Component traceability generates a large amount of data. To have access to this data most efficiently across production locations, cloud services can be a suitable solution. The most important competencies for production engineers and managers include the analysis of the benefits of the respective technology. Decisions on the implementation of the technology can only be made after an assessment of the benefits has been completed. For these decisions, competencies for the technical understanding of the technology are needed.

For the competence development, modular and mobile production lines can be used, that are called learning factory modules. However, so far no learning factory modules have been designed for component traceability, worker assistance and cloud services. Therefore, different design options for these three I4.0-technologies are developed in this paper. Furthermore, there is no structural approach that guarantees the optimal design of the learning factory modules: The goal of this paper is to find this optimal design. Therefore, a mathematical

optimization model is used and formalized by a multiple-choice knapsack problem (MCKP). The model is based on utility values for each design option and maximizes the sum of all utility values while respecting the available budget. Utility values are determined with the help of a utility analysis based for the requirements of the learning factory modules: technical, organizational and didactic requirements need to be determined by literature research and expert interviews. These requirements are based on the abovementioned competencies for I4.0-technologies. Each design option is evaluated based on the degree by which the requirements are fulfilled. An exact algorithm for the optimization problem guarantees the highest utility value possible and therefore the optimal design of the learning factory modules. Varying utility values or a varying budget results in a varying optimal design. As a result of this competence-based approach, modular learning environments for I4.0-technologies can be designed systematically (Tisch et al. 2017).

Keywords: Learning Factories, Learning Assistance Systems, Competence Development in Manufacturing, Smart Factories, Industry 4.0

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Practitioners' Track

On-Site vs. Off-Site Practices of MSD Intervention and its Impact on Organizational Productivity, Absenteeism and Costs. Theoretical analysis with application.

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Abstract:

Purpose: To measure to what degree MSDs, primarily back, neck and extremity pain impact productivity among knowledge-based workers and to learn if an On-Site treatment program could reduce such losses.

Theoretical Foundation: Absenteeism is missed work, and Presenteeism, the phenomenon when an employee is not working to their full capacity, both cost organizations financial losses. Using employees with MSDs, this study observed a correlation between these MSDs, absenteeism, and presenteeism,

Methods: Two randomized, controlled, trials (RCTs) designed to measure the impact that MSD pain has on employee productivity and absenteeism. The Work Limitations Questionnaire was used to calculate lost productivity averages, while MSD related absenteeism was measured, and both converted into total costs.

Findings: Average Lost Productivity Score (LPS) of 10.5%, cost €1,478.25 per person per year. The treatment group LPS dropped to 1.86%, saving €1,197.71. Control group rose to 12.06%, at a loss of €118.13. Statistically significant ($p < .001$) correlations were revealed between the LPS and clinical findings. Comparing the On-Site and the Off-Site models, total average absenteeism in working hours per-person, per-year were, 16.62 hours and 68.38 hours at a cost of €108.07 and €444.72 respectively with mean differences ($t(273) = -20.022$; $p < .001$).

Limitations: The study was unblinded.

Implications: An On-Site treatment strategy decreased absenteeism and productivity losses and associated costs.

KEY WORDS: Musculoskeletal disorders (MSD), On-Site Clinics, absenteeism, presenteeism, productivity.

1.0 Introduction

Every day, millions of people around the world suffer with nagging, chronic, aches and pains in their body, most commonly in their back and neck (Hoy et al., 2014; BMUS, 2014-2018), but also in their shoulders, wrists, hips, knees and ankles (Fit for Work, 2016). This suffering falls into a chronic disease category known as musculoskeletal diseases (MSDs). MSD, primarily back pain, is the single greatest cause of work disability, accounts for over 50% of work absences and for 80% of permanent work incapacity (Fit for Work, 2013). This puts a tremendous strain on government resources (BMUS, 2014-2018). With MSDs costing industrialized nations billions of dollars each year in productivity losses, millions of days of absenteeism and burdening inefficient health care systems, there is a tremendous need for cost containment and cost avoidance solutions related to MSD (Fit for Work, 2013, 2016). According to the Bone and Joint Initiative in the U.S. (BMUS, 2014-2018) MSD was the leading cause of disability in 2010. One in two adults were affected (126.6 million), twice the rate of chronic heart and lung conditions (NHIS 2012).

From the authors' perspective as a clinician, the unfortunate reality is, most people only seek medical advice after they have been suffering for weeks, months and even years. Likewise, most people self-medicate with anti-inflammatory medications, pain killers or other self-remedies, and learn to "live with the pain", or have come to accept the pain in their neck, back or other body parts as "normal". This "normal" daily pain and suffering over long periods of time, is known as sub-clinical and chronic symptomology, which may eventually lead to a person seeking medical advice or attention when the suffering reaches the critical point at which they are unable to go to work one day or they are now dealing with a drug addiction to pain killers. It is only at this critical, and very late stage in the disease process, known as clinical symptom stage, that organizations become aware that a problem even exists, because a person didn't show up for work. It is only at this late stage that some, if any organizations, even measure or record the absent from work day, unless it extended beyond 3 working days, or the employee did not have a legitimate medical authorization (CIPD, 2016; Fit for Work, 2016; Folger, 2018). Organizations around the world, regardless of industry or size, will have at least one, if not hundreds of employees suffering with sub-clinical body pain at any given moment. There are no currently accepted methods or mechanisms to detect, predict or measure this sub-clinical employee suffering, or the impact it is having on organizations every day in lost productivity and unrecorded work-absence, until the problem becomes chronic and serious enough to seek medical attention (DMAA, 2009; Hoy et al., 2014; CIPD, 2016; Klepper, 2017; Folger, 2018; Middlesworth, 2017). Again, from the authors' clinical and professional experience, including previous Masters research in the corporate world (Hatch, 2014), as well as, addressing this sub-clinical pain and suffering epidemic in three large and enlightened organizations in Portugal since 2007, the author became aware that the managers within these organizations, in their day to day activities, have very little awareness or concern for their own health, let alone, the health of their employees until it becomes a clinical or work-disability issue. Their professional lives are so full of other time pressures, responsibilities and regulation compliance, that employee health is outsourced to a third party, public or private medical facility for treatment and diagnoses. The companies that offer primary medical care within the workplace, rarely address MSDs beyond drug prescriptions (On-Site-OHS, 2017). This outsourcing to a third party (Off-Site) for consults, treatment and diagnostics, adds to the sickness absence and associated lost productivity of employees, but is rarely if ever truly

measured by organizations (Hatch, 2014; BD, 2017; Genowska, 2017). For the purposes of this article, productivity losses caused by MSD related presenteeism is the primary focus.

The practical implications of researching presenteeism is that such information can be used to properly educate managers to make informed and effective decisions when implementing health strategies (Schultz & Eddington, 2007). Schultz and Eddington also suggested that employers need to consider the health of workers who are low risk (MSDs) along with those who have high-risk health conditions, risk meaning, potentially life threatening (Schultz & Eddington, 2007).

2.0 Hypothesis

Hypotheses:

- *Neck and back pain cause absenteeism, productivity losses and associated costs.*
- *An On-Site clinical intervention for neck and back pain can reduce absenteeism, productivity losses and associated costs.*

3.0 Methods:

This project seeks to measure to what degree, sub-clinical (unrecorded) and clinical (sometimes recorded), workplace MSDs, specifically; neck pain upper extremity pain, mid-back pain, low back pain and lower extremity pain, financially impact three organizations in Portugal, in terms of lost productivity (Lerner, Rogers, & Chang, 2005) and absenteeism, through two separate randomized control trials (RCTs). The Work Limitations Questionnaire (WLQ) chosen for this study is one of the most frequently used globally, to measure productivity losses (Lerner et al., 2001). The tool consists of 25 items which measures the extent to which subjects can perform physical, mental, interpersonal and output demands on the job over the past two weeks. A lost productivity score (LPS) is attributed to each subject using a scaling and scoring algorithm calculation.

3.1 Design:

3.1.1 Presenteeism/Productivity

The study was designed to measure the LPS of the computer worker employee subjects prior to treatment. It was performed in two phases. *Phase 1*; each of the subject evaluated were scheduled to complete the WLQ. From a total of 300 subjects evaluated, employees were randomly selected for the treatment group and the control group, whom did not receive treatment. Tablet computers were used by the subjects to complete the WLQ on-line. The process only required approximately five minutes or of their time to complete and did not interfere with their schedules or require that they invest additional personal time in completing the survey. The average waiting time in all three clinics was typically between five and fifteen minutes depending on the time of day. This method also allowed for a nearly 100% compliance rate and willingness to participate. A final total of 277 subjects fully completed the WLQ over a two-week period but only 258 were usable due to errors in patient number entries on the digital form. This only became clear upon evaluation of the Excel sheets. Scheduling did not allow for participants to repeat the questionnaire.

Phase 2; For the follow up study, patients were randomly selected among the control (N = 87) and the treatment/Study (N = 86) groups respectively to repeat the WLQ at weeks 16-18. For

the treatment group, clinical data was collected at each visit to the clinic for care, to determine their symptomatology and record the number of treatments received. This data was later merged with their new WLQ scores for the purposes of correlational statistical analysis. A Likert scale question was added to the beginning of the Phase 2 WLQ, asking participants how many treatments they had received during the period between Phase 1 and Phase 2. The clinicians transmitted this information to the patients taking the WLQ, as it was recorded on each of their electronic health records, thus they could select the appropriate response accurately.

3.1.2 Absenteeism

The absenteeism RCT, consisted of different sample groups from the WLQ, used a scaled questionnaire (Paget et al., 1998) designed to measure the amount of absenteeism that was caused by employee MSDs and make a comparison between employees of each organization who used the On-Site clinics in the past year, with employees with MSDs who chose Off-site options. The questionnaire determined the amount of time, in terms of days and hours, that an employee missed work due to their MSDs in the context of disability days, treatments, medical consults and diagnostics. On-Site (N = 163) and Off-Site (N = 111). An average wage calculation was used to convert the average number of work-hours into a cost per-hour, per-case, which was converted into the average cost per-year, per-case (employee), (Goetzel et al., 2004; Mitchel & Bates, 2011).

3.2 Patient and Selection Criteria:

3.2.1 Presenteeism/Productivity Subjects

Prior to the administration of the WLQ, 300 volunteer subjects with self-reported neck and back pain etc., became patients of the clinics. 100 subjects from each of the 3 clinics were processed over a four-week period prior to the administration of the WLQ. Subjects selected for the WLQ technically became patients of the On-Site clinics and were processed by the teams of each clinic. Each subject underwent physical examination and history taking to determine their primary MSD complaints. All clinical data were recorded for later correlational evaluation. Due to capacity limitations of the clinics, not all the subjects could begin treatment, thus providing a natural control. Due to the time of year the study was performed, not all 300 of the subjects evaluated were available for the WLQ at Phase 1.

3.2.2 Absenteeism subjects

Absenteeism subjects consisted of employees of each organization who used the On-Site clinics in the *past year* and employees with self-reported MSDs for the past year who chose Off-site options.

3.3 Randomization:

3.3.1 Presenteeism/Productivity

For the WLQ, randomly selected treatment patients were called to the clinics as space became available over a 16-week period, therefore, each of the participants started their treatment on different dates during that period resulting in a range of treatments between 2 and 10 each.

The control group for the follow up study were randomly selected from the original sample and requested to complete the Phase 2 WLQ between weeks 16-18.

3.3.2 Absenteeism

Absenteeism subjects were randomly selected from over 3,000 current and past patients from the three on-site clinics while the control group were volunteer employees with self-reported MSDs but never used the on-site facilities for treatment.

3.4 Patient Care

3.4.1 Care in the Treatment Group

Patient care consisted of a team of chiropractors and physical therapists who performed; very specific, computer assisted spinal vertebrae analysis and treatment for neuro-muscular re-education, focussed on posture correction, work station posture evaluation and education, home and work exercises and stretching to improve posture and reduce physical stress on the spine and surrounding muscles. Educating patients was an integral part of each visit to the clinics.

3.4.2 Care in the Control Group

The WLQ and absenteeism control groups did not receive any treatment at the On-Site clinic. No external treatments, if any, were recorded for this study. It was assumed that the WLQ subjects did not seek external care for the symptoms. Most reported self-medicating or exercising to attempt to relieve their pain between phase 1 and 2. The absenteeism subjects on the other hand, were treated off-site in the past year.

3.5 Administrative Duties

It was the responsibility of the clinic staff, doctors, therapists and assistants, to record all patient data and to administer the WLQ and absenteeism questionnaire in each location. All On-Site clinic patient data was transferred from confidential patient files, matched with a patient identification numbers for cross reference, and put into Excel sheets.

4.0 Results

4.1 Productivity

The scaling and scoring process was applied to each of the subjects for Phase 1 and Phase 2. This provided us with the WLQ-LPS (Lost Productivity Score) that could compare the treatment group against the control group to be evaluated by company, age, gender and by a variety of symptoms.

4.1.1 WLQ Lost Productivity Scores

The WLQ Lost Productivity Scores in Phase 1, demonstrated an average loss of productivity of 10.5% for all three companies evaluated. This satisfies Hypothesis 1; *MSDs increase productivity losses...*

Table 1. WLQ LPS Phase 1 & 2 by Company

Company	WLQ Phase 1 Treatment	WLQ Phase 2 Treatment	WLQ Phase 1 Control	WLQ Phase 2 Control
A	13.08%	1.20%	13.36%	13.27%

B	7.77%	2.05%	9.75%	9.99%
C	10.88%	2.32%	10.48%	12.93%

Table 2. WLQ LPS Phase 1 & 2 Companies Combined

WLQ-LPS Combined Averages	Treatment: Phase 1	Treatment: Phase 2	Control: Phase 1	Control: Phase 2
Companies A, B,C	10.58%	1.86%	11.20%	12.06%

The Phase 2 results demonstrated a reduction in Total Average Productivity Losses from 10.5% to 1.86%. This satisfies Hypothesis 2; *On-Site MSD treatment Reduces Productivity Losses*.

Furthermore, evaluation was performed to look at WLQ-LPS and Age relationship as shown in table 3 below. It is clear, according to these results, that older employees have a higher percentage of lost productivity compared to younger employees.

Table 3. Age & WLQ LPS Comparison

Age Range	WLQ LPS
24-34	9.33%
35-44	9.60%
45-54	10.87%
55+	11.56%

4.1.2 Lost Productivity Costs

Annual, monthly and hourly wages were calculated using the average wage table for 2017. The average *monthly* salary in Portugal in the second half of 2017 was €1144.61, according to data from Trading Economics web site (2018). One year was used as a reference point for monetization because most employers evaluate health and productivity data over a one-year time frame (Goetzel et al., 2004). All calculations were based on an 8-hour work day (Bureau of Labor Statistics, 2008). Presenteeism costs were calculated by extrapolating estimates of productivity loss in the past 2 weeks (the WLQ Loss Score) to a 1-year time-period in days, multiplied by total daily compensation (Goetzel et al., 2004).

Accordingly, a cost analysis was performed to determine the financial cost of lost productivity between the treatment and control subjects as show in table 4 below.

Table 4. Cost of Lost Productivity. Study Group vs. Control Group

16-18 Week time frame between Phase 1 and Phase 2	WLQ LPS Total Average	Annual Compensation	Lost Productivity Cost per Person Per Year:	Calculation of Change Phase 1 – Phase 2	Net Savings or Loss Per Person Per Year:	
Treatment Phase 1	10.58%	x €13,735.32	€1,453.20	1,453.20 -255.49 =		

Treatment Phase 2	1.86%	x €13,735.32	€255.49		€1,197.71	
					Savings	
Control Phase 1	11.20%	x €13,735.32	€1,538.35	1,538.35 – 1,656.48 =		
Control Phase 2	12.06%	x €13,735.32	€1,656.48		-€118.13	LOSS
					Loss	

4.1.3 Productivity Statistical Results of Econometric Calculations

The purpose of this study was to determine if there was in fact a significant statistical correlation between work related MSD and productivity losses using the results from the WLQ LPS (Work Loss Questionnaire, Lost Productivity Score). The most common MSDs encountered in the On-Site clinical setting were; Forward Head Posture (FHP), Neck Pain, Upper Extremity Pain, Mid Back Pain, Low Back Pain, and Lower Extremity Pain. Additional factors/variables evaluated were Age, Gender and Cervical Spine Curvature.

Subjects were evaluated for the following clinical symptoms:

- *FHP* (Forward Head Posture): A common postural distortion among computer users. Used interchangeably in the body of the paper with FHC (Forward Head Carriage).
- *Neck Pain*: From behind the base of the skull to the posterior aspects of the neck muscles to shoulder level.
- *Upper Extremity Pain*: Included the shoulders, elbows and wrists or entire arm.
- *Mid Back Pain*: From the base of the skull to between the shoulder blades.
- *Low Back*: Waist level to sacrum level back pain.
- *Lower Extremity Pain*: Including hip, knee, ankle and general leg pain such as sciatica.
- *X-Ray Findings*: Evaluation of “Normal” and “Abnormal” cervical spine curvatures. Of clinical interest. Only 4.85% presented with Normal vs 95.15% with Abnormal Cervical Curve.

The analysis was made in four steps. We began to analyse the Pearson’s correlation. The results are shown in *Table 5* below. No correlation that was found to be significant at 0.1 or less and be higher than .5 in absolute value, a fact that implies that the data do not have multicollinearity.

Table 5 WLQ: Pearson’s Correlations & Clinical Presentation

N = 260	WLQ Prod. Loss Score	Gender	FHP	Neck Pain	Upper Extrem Pain	Mid Back Pain	Low Back Pain	Lower Extrem Pain	X Ray Finding	Age
WLQ Prod. Loss Score	1									
Gender	-.144 .067	1								

FHP	.228** * .000	.142** .022	1							
Neck Pain	.409** * .000	-.171** * .006	-.013 .833	1						
Upper Extremity Pain	.368** * .000	-.194** * .002	.024 .700	.299** * .000	1					
Mid Back Pain	.158** .011	-.086 .169	-.092 .138	.065 .297	.073 .238	1				
Low Back Pain	.385** * .000	.037 .549	.142** .022	.023 .714	.017 .781	-.139* * .025	1			
Lower Extremity Pain	.194** * .002	-.078 .211	.058 .354	-.058 .352	.003 .961	-.076 .224	.269** * .000	1		
X Ray Findings	.351** * .000	-.131** * .035	.195** * .002	.213** * .001	.129* * .037	.056 .366	.083 .185	.114* .066	1	
Age	.319** * .000	-.010 .876	.221** * .000	.049 .427	.155* * .012	-.100 .106	.124** .045	.236** * .000	.499** * .000	1

Note: *** Correlation is significant at the 0.01 level (2-tailed) **Correlation is significant at the 0.05 level (2-tailed) * Correlation is significant at the 0.1 level (2-tailed).

Secondly, we performed simple linear regressions, and the results are shown in Table 6. All the variables showed a strong relation with WLQ-LPS, the highest being with Age, FHP, Neck Pain, Upper Extremity Pain and Low Back Pain (with p significances lower than 0.01) followed by Mid Back Pain and Lower Extremity Pain, Back Pain (less than 0.05) and finally Gender (less than 0.1). In terms of coefficients, the highest were found to be related to Neck Pain, followed by Low Back Pain, Upper Extremity Pain and finally FHP. An increase in one unit in any one of those variables results in a productivity loss of more than 3 percent (3%) in organizations. These findings are important in policy terms, as we will discuss later (See Discussion).

Table 6 Simple linear regressions on WLQ LPS

Independent Variable	Adjusted R2	B	Sig
Age	0.098	0.001	0.000
Gender	0.009	-0.009	0.067
FHP	0.048	0.023	0.000
Neck Pain	0.164	0.037	0.000
Upper Extremity Pain	0.132	0.030	0.000
Mid Back Pain	0.021	0.014	0.011
Low Back Pain	0.145	0.034	0.000
Lower Extremity Back Pain	0.034	0.015	0.002

N = 260			
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Note: The WLQ Lost Productivity Score (LPS) represents the Dependent variable in the analyses of each category.

Third, given the high quality of the individual regressions, shown above, we performed a multiple regression whose results are shown in Table 7. So, all seven variables explain nearly 48 percent of total WLQ variation. More than that, five variables have very significant coefficients and of those, Low Back Pain had the highest impact in WLQ LPS score, of 3 percent per unit, Neck Pain has 2.7 percent, and Upper Extremity Pain of 1.8 percent.

Table 7 WLQ - Multiple Regressions

Dependent Variable	B	Significance
Age	0.010	0.09
FHP	0.014	0.03
Neck Pain	0.027	0.00
Upper Extremity Pain	0.018	0.00
Mid Back Pain	0.017	0.00
Low Back Pain	0.030	0.00
Lower Extremity Pain	0.006	0.99
N = 259		
R2 Adjusted = 0.476	Explains 48 percent of total variation of WLQ	
F value = 27.174, sig = 0.00	Significance total	

Finally, we made a comparison between Phase 1 and Phase 2 scores. The results are shown in Table 8.

Table 8 WLQ LPS Phase 1 (Pre) compared with Phase II (Post) with Control Group.

Phase I & Phase II comparison	Statistical Significance
Control Group N = 86	Not statistically significant difference: ($t(167.708) = .997; p .320$)
Treatment Group N = 87	Statistically significant difference: ($t(139,911) = 22,519; p < 0,001$)
N = 173	

The analysis demonstrates a statistically significant difference between the study group and the control group by a significant factor, demonstrating a robust correlation between the improvement or lowering of the WLQ LPS of subjects who were treated, and no statistical change of the WLQ LPS of the control group whom were not treated.

The final sample size for the study was: N = 258. Sex Distribution was: 51% Female, (N = 133) and 49% Male, (N = 127). The average age of the cohort was 44 years. The average WLQ Lost Productivity Score (LPS) across the three companies was 10.5%. It is interesting to note that the LPS was in fact impacted by the variables of age, gender and quite possibly industry, thus leaving the door open for future studies. As the LPS changed, so did the ultimate cost to the organization.

The average LPS for males was 10% and for females, 11%. Not found to be statistically significant when evaluated.

Clinical Correlations: Clinical correlations by symptoms were pulled from the data to test the LPS results. The absolute average of all symptoms was 10.52%, the same as the population in

general. Out of curiosity, it was interesting to learn which of the symptoms individually resulted in a higher LPS as well as which symptoms in combination resulted in the highest LPS. This was done to shed light on potential risk factors that could possibly be helpful in focusing resources accordingly to prevent and or correct the cause of the symptoms. The formula was applied to each patient with the corresponding symptoms.

FHP (Forward Head Posture) is when the ears of the patient are anterior, relative to their shoulders when they should be aligned on the vertical axis. The LPS for each of the pain symptoms evaluated is as follows: *FHP*: 11%, *Neck Pain*: 11.5%, *Upper Extremity Pain*: 12%, *Mid Back Pain*: 11.5%, *Low Back Pain*: 11.5% and *Lower Extremity Pain*: 11.3%. The highest combination was *Mid Back & Low Back Pain* at 13%. All combinations in pairs of two symptoms ranged from 12% to 13%. The few patients who had the unfortunate circumstance of experiencing all symptoms was 16.42% LPS on average. There were a surprising number of people in this range (N = 11). The lowest LPS in the group was 1.4% and the highest was 21%.

Cervical spine x-rays were taken on 64% (N = 165). Not all participants in the study were able to acquire x-rays in time for the study. The cervical x-rays were evaluated to determine the state of the natural cervical curve and to look for signs of early degeneration (arthritis), another type of MSD associated with poor posture. Among that population, only 5% of the patients had what would be considered a “normal” anatomical curve and 95% had abnormal curves of varying degrees. A comparison was made using the LPS. The 5% of patients who presented with a normal cervical curve and MSD pain symptoms had an LPS of 10.5%, and the 95% of patients who presented with abnormal cervical curve, 11.6%, just over a 1% difference. Accordingly, their respective costs per case, per year were €1,443.10 and €1,597.10, an increased lost productivity cost of €154.00 for employees with an abnormal cervical curve.

4.2 Absenteeism

4.2.1 Total Absenteeism Hours

Table 9 shows the total absenteeism hours per case by categories; disability, treatment, medical consults and diagnostics.

Table 9 Total Absenteeism Hours Per Case (by category): On-Site vs Off-Site

Category:	Disability	Treatment	Medical Consult	Diagnostics	<u>Total</u> <u>Absence</u>
On-Site:	4.88	10.2	0.82	0.89	16.62
Off-Site:	37.33	24.35	4.00	2.70	68.38

Figure 1 provides a visual perspective of the total MSD absenteeism in hours comparing On-Site with Off-Site. The greatest impact was on reducing disability hours and treatment times.

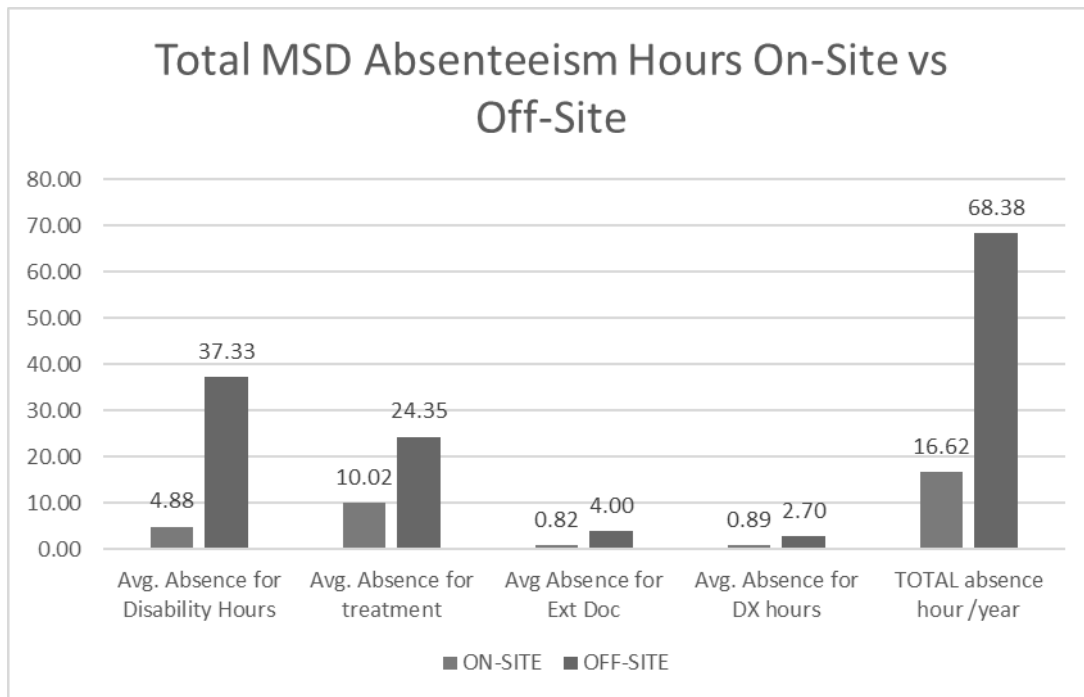


Figure 1 Total MSD Absenteeism Hours On-Site vs Off-Site

4.2.2 Total Absenteeism Costs

Total Absenteeism Cost of Lost Wages Per Person, Per Year: On-Site vs Off-Site. (All Categories)

Formula: Average Monthly Wage for Portugal: €1,144.61 / 22 Working Days

Average Daily Wage: = €52.03 / 8 hrs. per Day

Average Hourly Wage: = €6.50

Average Hourly Wage: €6.50 X Average Total Hours Absent Per Year (On-Site or Off-Site; All Categories) = Average Cost Per Person, Per Year.

Table 10 below shows the total MSD related absenteeism cost comparing On-Site with Off-Site treatments.

Table 10 Cost Calculations: Total MSD Related Absenteeism On-Site vs. Off-Site

	Av. Hourly Wage	Av. Total Hours Absent Per-Person, Per-Year	Av. Total Cost Per-Person, Per-Year
On-Site	€6.50 X	16.62	= €108.03 (108.07)
Off-Site	€6.50 X	68.38	= €444.47 (444.72)

4.2.3 Statistical Results of Econometric Calculations

Table 11 shows the mean differences between the On-Site (N= 163) and Off-Site (N= 111) demonstrate a very strong statistical significance, all categories with a 95% confidence level of the difference.

Table 11 Statistical Analysis of Absenteeism Data: Mean differences

Absenteeism Variables	Statistically significant mean differences
Q2 Disability	(t(117.583)=8.477; p<.001)
Q3 Treatments	(t(169.042)=13.567; p<.001)
Q4 External Consults	(t(167.547)=9.270; p<.001)
Q6 External Diagnostics	(t(183.525)=8.183; p<.001)

Table 12 Treatments & Consults; On-Site versus Off Site – linear regression

Dependent Variable	Adjusted R2	B	Sig
Onset to Treatment	0.641	-83.971	0.00
Disability	0.270	-32.450	0.00
Treatments	0.298	-49.223	0.00
Medical Consults	0.270	-19.347	0.00
Diagnostics	0.215	-1.814	0.00
N = 273			

The statistical evaluation of this finding demonstrated high statistical significance. All very robust. Onset of symptom to treatment demonstrated the greatest variance between On-Site and Off-Site. Disability and Treatments are the primary causes of MSD related absenteeism. Consults and Diagnostics, though statistically significant, demonstrate a slightly lesser overall impact.

5.0 Discussion

In the first instance, both the Phase 1 and Phase 2 studies demonstrated that MSDs do indeed result in a loss of employee productivity which results in associated costs to the organizations studied. In the second instance, the On-Site MSD intervention clinic reduces productivity losses and associated costs by a factor of nearly 6 times across the three companies and by a factor of 11.5 times for the older population group. As a matter of interest as to which categories had the greatest impact on productivity, it is noted that time management tasks; physical tasks; mental-interpersonal tasks and output tasks were all effected. The most significant improvements were within the physical tasks, and output tasks, indicating that they were more productive performing the required physical tasks of their jobs such as walking, bending, lifting, sitting, and more capable at completing their job tasks and work load on time, respectively.

In the third instance, On-Site intervention for MSDs demonstrated significantly lower absenteeism hours and resulting costs compared to Off-Site interventions.

6.0 Conclusion

The results of this study can be used to develop a useful tool for business decision makers and their HR directors, to determine the potential costs of not treating an employee population suffering with MSDs. Ultimately, evaluations via questionnaire and or physical exams should be part of an organizations HRA (Health Risk Assessment) process. This way, the formula can be applied to any size employee population to arrive at an estimated cost of lost productivity

associated with MSD sufferers. Armed with the knowledge that MSDs, such as active neck and low back pain, have been shown to cause substantial absenteeism and productivity losses, thus substantial financial losses for the organization, an HR(Human Resource) director can justify to their superiors, investing in an On-Site MSD clinic for the sake of early intervention/treatment, as well as perform screenings for prevention of future losses. The HR director, or whomever is tasked with evaluating the benefits of installing and integrating an MSD clinic into their organization, would need to do their own cost-benefit analysis to determine, based on the cost of installation and on-going services, if the On-Site clinic would save their organization money in the long run based on the lost productivity score (LPS) of their population. The WLQ comes in a short form of only 15 questions and could easily be implemented into an employee health screening process.

Most organizations lack a critical piece of context about musculoskeletal health, and some organizations completely miss it. The bottom line is managing musculoskeletal health efficiently and effectively is a massive opportunity that can impact entire organizations. Such management would impact safety and wellness, yes, but it would also dramatically impact other areas of the business such as; productivity, company culture, and brand equity. As the EU member states are looking for methods to decrease health care spending and productivity losses, the On-Site MSD intervention clinic solution is worth investigating further and repeating the methods used for this study.

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Public Policies

Organization Diagnosis before Development: Case study of Public Hospitals in Thailand

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Abstract: In 2015, the Healthcare Accreditation Institute had a three-year project (2015-2017), Engagement for Patient Safety (EFPS), which call for volunteering public hospitals in Thailand to participate in improving patient safety at all levels of healthcare. Organization management is one of the 12 critical issues for leadership commitment in order to improve the patient safety in hospital. “Nine Cells” was selected as an organization diagnosis tool to create a sense of urgency for the hospital administrators and to provide an organization management skill of “alignment”. This paper would like to promote the concept of “Organization diagnosis before development” and to demonstrate how to use the Nine Cells as an organization diagnosis tool. At the end the authors shared the lesson learned from the leadership development program over the three-year project of EFPS.

Keywords: Organization Development, Diagnosis, Hospital, Public Sector, Thailand

1 Introduction

The Healthcare Accreditation Institute (Public Organization) (HAI) was initiated under Health Systems Research Institute (HSRI) as a research program “Mechanisms on Promoting Hospital Quality Improvement” since 1997 and it became a public organization in 2009. HAI operates under the principle of “Being an independent organization with reliability and agility, having evidence-based operations which are sensitive to national health context and culture.”

In 2015, the HAI had initiated a three-year project (2015-2017), Engagement for Patient Safety (EFPS), which call for volunteering public hospitals in Thailand to participate in improving patient safety at all levels of healthcare: from primary to referral level and all modalities of healthcare including prevention, diagnosis, treatment and follow up. There are 12 areas for improvement for patient safety, safety hospital and safety healthcare service (see Figure 1). Organization management is one of the improvement areas that is required hospital administrators to attend the workshop and to take the responsibility for the recommendations from diagnosis result. “Nine Cells” was adopted as an diagnosis tool for the organization management in this project.



Figure 1: Engagement for Patient Safety (EFPS) Framework

2. Problem Statement

Yoelao, Mohan, & Abdul Hamid, (2014) has addressed “Patient Safety” as a critical component of the quality in health care especially in the developing countries such as Thailand and Malaysia. According to WHO (2014), “Patient safety” is the absence of preventable harm to a patient during the process of health care. The discipline of patient safety is the coordinated efforts to prevent harm, caused by the process of health care itself, from occurring to patients. Over the past ten years, patient safety has been increasingly recognized as an issue of global importance, but much work remains to be done”. In Thailand the government has clear strategic goals to ensure patient safety and quality in the medical care that is provided. For ensuring the quality of health care in Thailand, hospitals get accreditation from Healthcare Accreditation Institute (HAI).

To engage the hospital administrator, HAI needed to provide not only skillset for leadership development, but mindset and toolset are needed. Kramer (2016) has proposed the new paradigm of leader development with the focus of transforming mindsets more than skillsets. Skills are necessary but not sufficient for leadership. Drawing on the latest discoveries in neuroscience and cognitive science, and the theory of “unlearning” of Otto Rank, Kramer suggested the leaders should be learning how to radically transform their current mental models when they are out-of-date or no longer useful, there by creating greater capacity for seeing what others cannot see and thinking what others have not yet thought (Kramer, 2016, p. 26). In order to see what others cannot see clearly, the organization need a diagnosis tool.

Alderfer (1980) stated that organizational diagnosis is a process based on behavioral science theory for publicly entering a human system, collecting valid data about human experiences with that system, and feeding that information back to the system to promote increased understanding of the system by its members (p. 459). Also, Janićijević (2010) stated the

important of organizational diagnosis is a method to analyze an organization and identify its deficiencies (p. 85).

Nine Cells was selected as a toolset or an organization diagnosis tool to create a sense of urgency for the hospital administrators and to provide an organization management skill of **“alignment”**. Akaraborworn, Chareonsap and Yodrakang (2015) have developed “Nine Cells” as an organization diagnosis tool for public sector since 2014. Office of Public Sector Development Commission (OPDC) has a mission to provide consultation for public sectors in order to cope with change.

3 Research Objective

3.1. To promote the concept of “Organization Diagnosis Before Development” for the public hospitals in Thailand

3.2. To demonstrate how to use Nine Cells as an organization diagnosis tool to create a sense of urgency for hospital administrator under the project of Engagement for Patient Safety 2015-2017

3.3. To share the practices of leadership development program over the transformation

4. Organization Diagnosis before Development

The concept of “Diagnosis before Development” has long been embedded in Thai community since 1992 when the King Bhumibol Adulyadej proposed the sciences of the King “Understanding, Connecting, and Development” (เข้าใจ เข้าถึง พัฒนา) in which he behaved himself and bestowed towards Thai citizen to develop our country throughout seventy years of his reign. Akaraborworn and Sakworawich (2017) as organization developers, has adopted the sciences of King to present as modern organizational developmental process proposed by Cummings and Worley (2009) which consists of data collection, diagnosis, and feedback before intervention design. The eight steps of Cummings and Worley’s modern organizational development process are aligned with the sciences of the King. Akaraborworn and Sakworawich (2017) illustrate the adaptation plan for applying the sciences of King for organizational development in the Healthcare Accreditation Institute (Public organization) (HAI) such that the HAI has shifted the paradigm from an evaluator role to facilitator and co-developer.

Under the Organization Development (OD) process proposed by Cummings and Worley since 1995, the word “diagnosis” was used in four out of the eight steps of OD process: Diagnosing organization, Diagnosing group and jobs, Collecting & analyzing diagnostic information and Feeding back diagnostic information. Cummings and Worley have proposed this OD Process in 1995 which was published in Organization Development for Change 1st Edition.

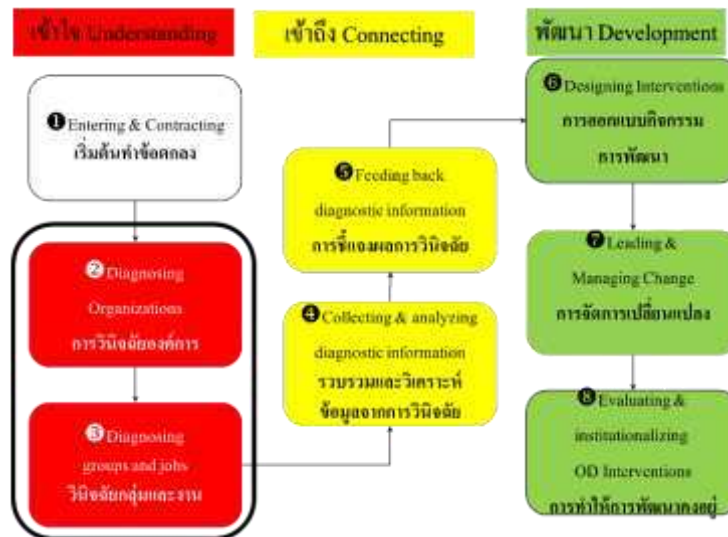


Figure 2: Integrating Organization Development Process under the sciences of the King Rama IX: Understanding, Connecting and Development

The word “Diagnosis” is used normally in healthcare context; thus, it is suitable for the organization development approach in hospital setting. Diagnosis is the process of understanding how the organization is currently functioning, and it provides the information necessary to design change interventions (Cummings & Worley, 2008, p.87). Elving (2005) stated that effectiveness of the change, or its success, is also dependent of the correct diagnosis of the problems and the change itself (p. 135).

Cummings and Worley (2008) defined “organization diagnosis” is a collaborative process between organization members and the OD consultant to collect pertinent information, analyze it, and draw conclusions for action planning and intervention. Diagnosis may be aimed at uncovering the causes of specific problems, focused on understanding effective processes, or directed at assessing the overall functioning of the organization or department to discover areas for future development. Diagnosis provides a systematic understanding of organizations so that appropriate interventions may be developed for solving problems and enhancing effectiveness (p. 88).

Diagnosis before development is a critical stage in the OD process which is like “Solving the right problem NOT solving the problem right”. Recently, Harvard Business Review has an article, “Are you solving the right problems?” written by Wedell-Wedellsborg (2017). He conducted surveys of 106 C-suite executives who represented 91 private and public-sector companies in 17 countries and found that a full 85% strongly agreed or agreed that their organizations were bad at problem diagnosis, and 87% strongly agreed or agreed that this flaw carried significant costs. Fewer than one in 10 said they were unaffected by the issue. The pattern is clear: Spurred by a penchant for action, managers tend to switch quickly into solution mode without checking whether they really understand the problem.

5. Nine Cells as an Organization Diagnosis Tool

Nine Cells is an organization diagnosis tool initiated from two major principles: (1) Nine Performance Variables by Rummler and Brache (1995) and (2) PMQA (Public Sector Management Quality Award) applied from Malcolm Baldrige, the Quality Management Criteria, U.S.A. The concept of organization diagnosis survey aimed to identify the alignment of goal, design and management in organization, department and individual levels.

Rummler and Brache (2012) have provided a holistic view of organizational diagnosis. They have divided organizational performance into three levels: organizational level, process level and individual level (p.12). They viewed organizations as “ecosystem” - complex network of interconnected system - and contended that to improve performance we need to understand the whole system. Since 1995, Rummler and Brache have introduced **Nine Variable Matrix** (see Table 1) that exhibits a comprehensive picture of the three levels of performance and other related factors. The first dimension of the matrix contains a framework. The second dimension includes three factors termed as performance needs, that determine effectiveness at each level of performance.

Table 1: The Nine Variable Matrix

	Goals	Design	Management
Organization Level	Organization Goals	Organization Design	Organization Management
Process level	Process Goals	Process Design	Process Management
Job/Performer Level	Job Goals	Job Design	Job Management

From Rummler and Brache (1995)

Akaraborworn, Chareonsap and Yodrakang (2015) have applied these Nine Performance Variables to “Nine Cells” which represent three levels of organization, department / team and individual levels. They developed the questions in the survey from those two principles and tested by an expert team from OPDC. There are four questions under each cell, thus the total of questions is 36. Each cell is called Cell #1 to Cells #9 as shown in Figure 3. The arrows between the cells represent the needs for “ALIGNMENT” in organization development.

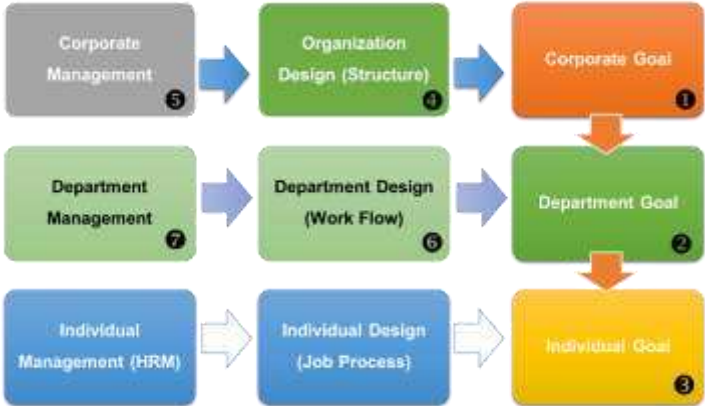


Figure 3: Nine Cells – an organization diagnosis tool
 From Akaraborworn, Chareonsap and Yodrakang (2015)

First alignment in Nine Cells is the alignment of Cell # 1-2-3: Organization Goal – Department Goal – Individual Goal. Second alignment is the alignment of Cell # 1-4-5: Organization Goal – Organization Design (Structure) – Organization Management. Third alignment is the alignment of Cell # 2-6-7: Department Goal – Department Design (Work Flow or Work Standard) – Department Management. Forth alignment is the alignment of Cell # 3-8-9: Individual Goal – Individual Design (Work Process) – Individual Management (HR Management). The numbers of each cell indicate the series of problem solving or organization development.

Table 2: Summary of questions under each cell in Nine Cell organization diagnosis tool

Cell #	Cell Title	Summary of question
1	Organization Goal	<ol style="list-style-type: none"> 1. Hospital Vision Clarification 2. Vision Communication 3. Hospital Strategy 4. Short-term and Long-term Plans
2	Department Goal	<ol style="list-style-type: none"> 13. Alignment of department goal with the hospital goal 14. Department strategies from stakeholders' need 15. Department operation plans 16. Risk management
3	Individual Goal	<ol style="list-style-type: none"> 25. Alignment of Individual performance with the department goal 26. Clear accountability 27. Appropriate individual goals 28. Challenging works
4	Organization Design (Structure)	<ol style="list-style-type: none"> 5. Alignment of hospital structure with its vision 6. Appropriate units under the hospital structure 7. Appropriate structure to support the collaboration between units 8. Reviewed and revised corporate regulations
5	Organization Management	<ol style="list-style-type: none"> 9. Monitoring the hospital performance 10. Allocate enough budget and resources to support hospital strategies and goals 11. Communication channels supporting collaboration between units 12. Management transparency
6	Department Design (Work Flow/Standard)	<ol style="list-style-type: none"> 17. Appropriate work responsibility within unit 18. Work flow responding to stakeholders' needs 19. Knowledge management 20. IT support
7	Department Management	<ol style="list-style-type: none"> 21. Monitoring unit's performance 22. Allocation budgets and resources to support the unit's performance 23. Communication between teams under the units 24. Data analysis for decision making

Cell #	Cell Title	Summary of question
8	Individual Design (Work Process)	29. Appropriate work accountability 30. Appropriate work process 31. Appropriate work environment 32. Job Rotation
9	Individual Management (HRM)	33. Allocate budget and resources to support the individual performance 34. Training and development 35. Career Management 36. Employee Engagement

6. Leadership Development Program

One of the six HAI objectives is to formulate curricula and train healthcare personnel in order to escalate understanding on tools for quality assessment, quality improvement and accreditation of healthcare organizations (HAI, 2019). In 2015-2017, HAI has adopted Nine Cells for conducting hospital diagnosis on-line under the project of “Engagement for Patient Safety”. In 2015, there are 132 public hospitals with 90,932 subjects volunteering to participate in this project. The objectives of this project are (1) to provide an organization diagnosis tool for volunteering public hospitals, (2) to develop a public policy for Thai health care development and (3) to enhance the leadership skill for hospital administrators. Nine Cell diagnosis tool is one of the three diagnosis tools that the author conduct. The other tools are Emo-meter (Employee Engagement Survey) and Patient Safety Culture. For this article, the authors focus on only one diagnosis tool (Nine Cells) and the leadership development workshop how to use the diagnosis tool to transform the organization.

To transform any organization, the organization leaders are required mindset transformation first. Kramer (2016) stated that in the new paradigm, leader development will focus on transforming mindsets more than skillsets due to the quality of the leaders’ judgement which depends on the quality of their mental models. “Mental model”, proposed by Senge (1990) in Learning Organization, means deeply held internal images of how the world works, images that limits us to familiar ways of thinking and acting. Very often we are not aware of our mental models or the effects they have on our behavior (Senge, 1990, p. 8). To develop the mental models of the leaders, they need toolset to guide them in visualizing the unclear problems and unclear solutions. Horth and Vehar (2002) recommended three essential building blocks for effective innovation leadership development:

- Toolset: The collection of tools are techniques used to generate new options, implement them in the organization, communicate direction, create alignment and cause commitment.
- Skillset: A framework that allows innovation leaders to use their knowledge and abilities to accomplish their goals. More than tools and techniques. It requires facility, practice and mastery of processes.
- Mindset: The attitudes and resulting behaviours that allow the tools and skills to be effective. The mindset is the fundamental operating system of the creative thinker and

distinguishes those leaders who enable creative thinking and innovation from those who shut it down.

These three building blocks were put into the workshops during the EFPS project under the organization module in 2015-2017. Each year, HAI conducted two one-day workshops in February and May. Each year, the workshops were conducted before and after on-line systems available for the volunteering hospital. Each hospital has a quota of two persons to attend the workshops, one of them needs to be in administrative level. Nine-Cell diagnosis tool was used as a major tool for this module. The main objectives for 1st workshop are to introduce the on-line diagnosis tool and to promote the important of “Managing by Fact-based” for hospital administrators. The 2nd workshop’s objectives are to teach how to read the diagnosis result and to share the diagnosis result in overall. (See Table 3)

Table 3: Content in the workshops under EFPS organization management module

Date of WS	Mindset	Toolset	Skillset
Workshop 1 11 May 15	<ul style="list-style-type: none"> ▪ Important of diagnosis ▪ Objectives and expected outcomes from EFPS project 	<ul style="list-style-type: none"> ▪ Introducing Nine Cells as an organization diagnosis tool 	<ul style="list-style-type: none"> ▪ “Change agent” as a critical competency for hospital administrator ▪ Introducing “OD” and OD process for hospital development
Workshop 2 14 May 15	<ul style="list-style-type: none"> ▪ Important of “Alignment” ▪ Nine-Cell diagnosis result as a whole 	<ul style="list-style-type: none"> ▪ How to read the diagnosis result for each hospital ▪ How to use the development menu to improve the target cells 	<ul style="list-style-type: none"> ▪ “Systems Thinking” as a critical thinking skill for administrators
Year 2016	Mindset	Toolset	Skillset
Workshop 1 5 May 16	<ul style="list-style-type: none"> ▪ Important of communication before conducting the diagnosis ▪ Learning from 5 top hospitals whit highest scores of data collection 	<ul style="list-style-type: none"> ▪ FQA of diagnosis tool ▪ Step-by-step how to use the diagnosis tool 	<ul style="list-style-type: none"> ▪ How to prioritize cells in organization development
Workshop 2 13 May 16	<ul style="list-style-type: none"> ▪ Learning from the 5 top hospitals with high developing range scores 	<ul style="list-style-type: none"> ▪ Comparing the survey results conducting in 2015 and 2016 ▪ 7 steps of how to read the survey results and develop the action plan 	<ul style="list-style-type: none"> ▪ Comparing Nine-cell with 7-S Framework of McKinsey in the SWOT analysis
Year 2017	Mindset	Toolset	Skillset
Workshop 1 23 May 15	<ul style="list-style-type: none"> ▪ Sharing the benefit of using Nine-Cells diagnosis results to improve the hospital 	<ul style="list-style-type: none"> ▪ Quiz: Matching 36 questions within each cell 	<ul style="list-style-type: none"> ▪ Sharing the alignment of the survey results and the action plans from the last two years

Date of WS	Mindset	Toolset	Skillset
Workshop 2 16 May 15	<ul style="list-style-type: none"> ▪ Learning from 5 good example hospitals 	<ul style="list-style-type: none"> ▪ Reviewing the three-year diagnosis process ▪ Providing recommendations for improvement 	<ul style="list-style-type: none"> ▪ Looking back what having done during these three years

Note: OD = Organization Development

7. Research Method

Nine-Cell diagnosis tool is a survey research, a method for gathering information from a sample of individuals (Scheuren, 2004, p.9). Bartlett (2005) stated that the purpose of survey research in organization is to collect information from one or more people on some set of organizationally relevant constructs. Nine-Cell data collection would like to discover the variations differ from different group of employees, thus, it covered four groups of hospital employees: administrators, healthcare professional, healthcare supporters and general support. In the first year of EFPS (2015), there were 132 public hospitals with 90,932 subjects volunteering to participate in this project.

These volunteering public hospitals are 40% of public community hospitals and 30% of the primary, secondary and tertiary care hospitals. Almost all of them (94%) are under the Ministry of Public Health. Most of them (83.33%) are accredited by HA Level 1 and 2. These participated hospitals have varied sizes from less than 100 employees in community hospital to over 10,000 employees in tertiary care hospitals. Every hospital had an agreement at the beginning of the project that each participated hospital needed to provide the data collection over half of their employees. If not, the data analysis would not be conducted.

Nine-Cell diagnosis tool tested in 2015 by OPDC, Akaraborworn, Chareonsap and Yodrakang (2015) have developed the questions in the survey from the two principles)1(Nine Performance Variables by Rummler and Brache)1995(and)2(PMQA)Public Sector Management Quality Award(applied from Malcolm Baldrige, the Quality Management Criteria, U.S.A. There are four questions under each cell, thus the total of questions is 36. The content validity of the questions was tested by the expert team from OPDC. The survey was tested with 563 government officers working in 10 departments and 10 provinces. Confirmatory Factor Analysis)CFA(and reliability were conducted and confirmed that the survey can be implemented. Nine-Cell diagnosis questions was tested for content validation again by the expert team from HAI in order to assure that these questions are appropriate under the public hospital setting.

The data analysis was conducted at individual level, group level and organization level (hospital). Each participant can see his or her own Nine-Cell result right away after finishing 36 questions. With the quick feedback of survey result, the participant was motivated to complete his or her own survey. The participated hospitals can see the real time numbers of the completed survey, so they can monitor the numbers of incomplete participants better in order to reach 50% of respondents as agreement. Moreover, to provide a friendly competition among the participated hospitals, the percentage of completed participants of each hospital was shown on the first page for hospital administrators to visit anytime and be able to take

action. The Nine-Cell results were compared between different four groups (administrators, healthcare professional, healthcare supporters and general support) to create the sense of urgency. Peterson and White (1992) stated that individuals' perceptions of the culture and climate of the organizations in which they work influence their motivation and individual performance. Thus, the perceptions of the employees within a hospital might be various among different groups of employees.



Figure 4: Example of on-line Nine-Cell Diagnosis tool

To increase the validity of the survey result, the participated hospitals were encouraged to communicate the value of this Nine-Cell diagnosis tool. Bartlett (2005) mentioned about the quality of the survey results reflects the perceptions of the value of survey research both relate to key respondent behaviors such as following directions, timeliness to respond, and willingness to participate in the survey. Thus, the first workshop before launching the survey each year, the participated hospitals need to develop the content promotion and communication channels in their own organization to ensure the willingness of survey participants.

For data screening, some of the participants were rejected from the diagnosis calculation if they have the same answers over 80% (28 questions) which presented unreliability of the test. Each year, there were about 40-50% of rejected participants due to this condition. However, there were enough data for calculation (See Table 4)

Table 4: The numbers of participated hospital, participants, respondents and analysed data

	Yr. 2015	Yr. 2016	Yr. 2017
Participated hospitals	137	141	136
Completed data analysis	132	132	135
Participants	90,932	103,563	112,489
Analysed data	50.76%	48.04%	47.12%

Data analysis for Nine-Cell diagnosis tool is “mode” which is a set of data that appear most often (Gujarati, 2006, p. 110). Mode was used to analyse the data at individual, group and organization levels.

At individual level, each cell has four questions or items, thus the ratings of “Agree”, “Not sure” and “Disagree” are accumulated into the result of each cell. The cell result was summarized and shown in colour to create sense of urgency: “Red” represents urgent for improvement when the green items are shown less than 2, “Yellow” represents need for improvement when two green items are shown and “Green” represents sustain when the green items are shown more than 2. (See Figure 4)

At group level, mode was calculated from the accumulated scores of employees under each group: Administrator, Healthcare Professional, Healthcare Supporter and General Supporter. The cell result was summarized and shown in colour to create sense of urgency for each group of employee: “Red” represents urgent for improvement when most employees disagree with the statement, “Yellow” represents need for improvement when numbers of agree are equal the accumulated scores of disagree and not sure and “Green” represents sustain when most employees agree with the statement.

At organization level, the Nine-Cell presented the agreements from these four groups. “Red” represents urgent for improvement when there are more than one group disagrees and/or not sure with the statement. “Yellow” represents need for improvement when there are two groups agree with the statement. “Green” represents sustain when there are more than two groups agree with the statement (See Figure 6).

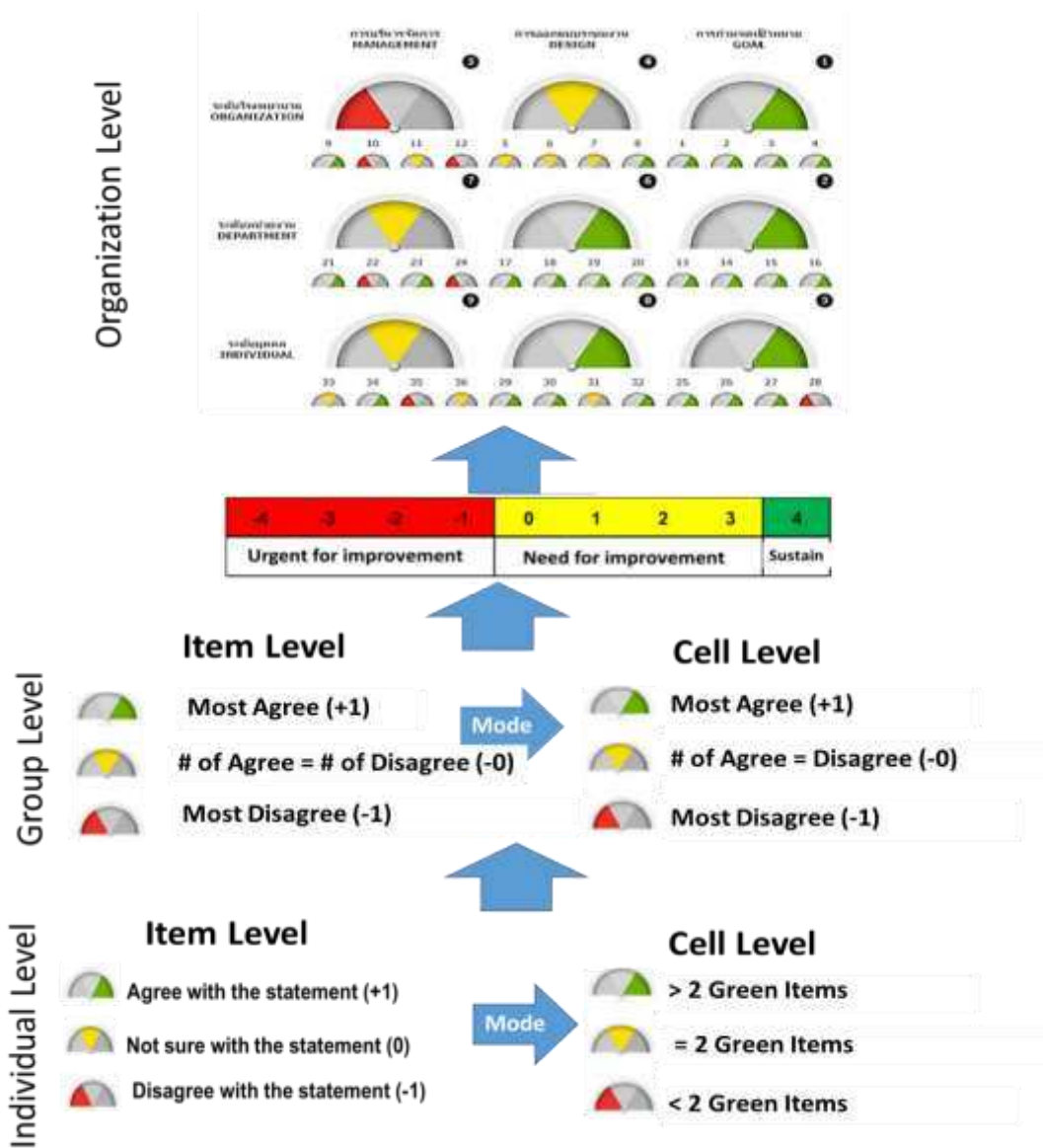


Figure 5: Example of rating scales from individual level to group data analysis



Figure 6: Example of Nine-Cell data analysis at group level and organization level

8. Research Result and Discussion

The main objective of conducting the Nine-Cell organization diagnosis tool is to provide the diagnosis feedback for each organization which is at hospital unit in order to create a sense of urgency for the administrators to see the alignment of their management clearly. Rummler and Brache (2012) stated that most of the administrators lack the ability to properly comprehend the alignment between all the levels of an organization (Rummler and Brache, 2012). Providing the Nine-Cell diagnosis tool can assist the administrator to see the problems clearly and be able to prioritize the problems in his or her organization.

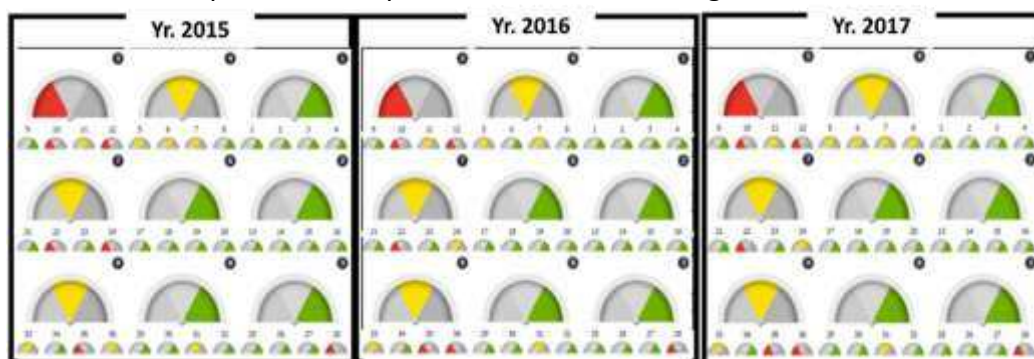


Figure 7: Nine-Cell results in overall over three-year project

Figure 7 compared the Nine-Cell survey result in 2015 -2017, it found the similar result over the past three years. The organization – department – individual goals are aligned except the item# 28 Challenge works which most of the employees disagreed. Moreover, the organization design and management have not aligned with organization goal which indicated by the item# 5-6-7-8: Alignment of hospital structure with its vision, Appropriate units under the hospital structure, Appropriate structure to support the collaboration between units and Reviewed and revised corporate regulations.

The budget allocations in organization, department and individual level have not aligned with their goals and shown urgent for improvement which indicated by the item# 10-22-33: Allocate enough budget and resources to support hospital strategies and goals, Allocation budgets and resources to support the unit's performance and Allocate budget and resources to support the individual performance.

Management at organization-department-individual levels presented the urgency for improvement especially item 12 (Management transparency) and need for improvement in item# 11 (Communication channels supporting collaboration between units). Management at department level presented the need for improvement in item# 24 (Data analysis for decision making). Management at individual level presented the urgency for improvement in item# 35 and 36 (Career Management and Employee Engagement).

However, the main objective of Nine-Cell diagnosis is to provide the collective information from different groups of employees in an organization in order to create a sense of urgency for hospital administrator to see the alignment of goal – design – management at organization

– department – individual levels. This tool assisted the administrator to prioritize the problems in a hospital. Thus, the survey results were reported confidentially for each volunteering hospital. Table 5 summarized the prioritized cells that most of the hospitals need to develop during the three-year project.

Table 5: Development needed cells from participated hospitals over three-year project

Need for Improvement	Year 2015 (132 Hospitals)	Year 2016 (132 Hospitals)	Year 2017 (135 Hospitals)
Cell 1: Organization Goal	66 Hospitals 50.00%	66 Hospitals 50.00%	73 Hospitals 54.07%
Cell 2: Department Goal	2 Hospitals 1.50%	3 Hospitals 2.30%	1 Hospitals 0.74%
Cell 3: Individual Goal	35 Hospitals 26.50%	34 Hospitals 25.70%	32 Hospitals 23.70%
Cell 4 – 9: Design and Management in Organization – Department – Individual Levels	29 Hospitals 22.00%	29 Hospitals 22.00%	28 Hospitals 20.74%

The research results showed that more than half of the public hospitals needs to develop Corporate goal (Cell 1), while they perceived that they have clear Department Goals (Cell 2) and Individual Goals (Cell 3). Lepmets, McBride and Ras (2012) illustrated the important of alignment of organization’s business goals throughout process improvement. Their research result showed that there is little knowledge and experience in industry in alignment the process goals and organization’s business goals.

However, these hospitals cannot perform effectively if they cannot align the department goal and individual goal with the corporate goal which is unclear and not communicated well. The evident showed that the corporate goals for public hospitals in Thailand were changed regularly to support the new policies from uncertainty governments. Thus, the Ministry of Public Health should provide clear directions and long-term goals within the form that is easy to communicate to the hospital administrators.

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Soft Skills Empowerment: Closing a Gap in the Knowledge Economy

Agenda

Color Preferences for Project Team Members in the Context of Their Team

Role

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Abstract: The presented paper discusses the color and the possibilities of its perception as a reflection of the behavioral preference in the project team. Color is here examined as a mean of expressing the personality preferences and the associated characteristics. The aim is to compare the preferences of certain team roles defined by Belbin (2003), (2004) with color preference in the context of team work in the project team, to try to find the answer to the question of whether the preference of a specific color reflects the preference of a certain team role. The paper contains an analysis of the data obtained from a detailed questionnaire survey (N = 69) carried out in two successive steps, followed by a synthesis of the findings to verify the hypothesis H: The preference level of a certain team role differs from the preference of a particular color.

Key words: Team role, color, Belbin, project team.

1 Introduction

With the gradual development of technology, the volume of information in visual form is increasing. Unlike a written form, the picture can capture and convey a much larger volume of data, objects, relationships between them, or even the emotional charge of the captured situation. And along with the increasing amount of pictorial material that surrounds us, the importance of knowing each of its elements and their meaning is currently growing.

Colors, as one of the first stimuli that we analyze and evaluate when looking at a thing, man or situation, have gained an irreplaceable space in the symbolic conception of the world around us with the development of human culture. They are attributed to different meanings and characteristics, both based on our own experience and, on the other hand, on their

meanings in general, stemming from the cultural environment in which we live and therefore common to the entire group, the community. Symbolic meanings are associated with color to the extent that they can serve as a means of sharing information about ourselves, own feelings, characteristics, preferences, etc. In the context of color psychology, especially the question of the psychophysiological effects of individual colors on an individual was examined, as stated by Clark (1984); Brožková (1982); Lüscher (1991), (1997) or Pleskotová (1987). On the other hand, it is generally known that our color preferences can tell us a lot about our character, as claimed by Veverková (2002) or Mlynářová and Orlita (2006).

The team role, as described by Belbin (2003), (2004), combines the needs of the group respectively of the working team to meet the chosen goal and the individual as the bearer of certain dispositions. In the teamwork, essentially as in any other social group, several possible roles are determined. Belbin (2003), (2004) determined nine key roles for teamwork and prepared a personality inventory to identify them, which determines the magnitude of the tendency to behave in one of the defined ways. Here, it is worth to highlight the fact that despite some negative characteristics, the individual roles are a selection of "beneficial" patterns of behavior.

The intentional and conscious selection of a certain color is in essence also behavioral in a particular social situation (Picco and Dzindolet, 1994; Kitao and Kitao, 1986). **It is therefore possible to assume that there is a relationship between the team role and the preference of color.**

2 Goal and methodology

The aim of presented paper is to compare the preferences of certain team roles defined by Belbin (2003), (2004) with color preference in the context of project teamwork, to try to find the answer to the question whether the preference of a specific color reflects the preference of a certain team role.

The team role based on Belbin's concept described not only by Belbin (2003), but also by Bělohávek (2008), characterizes the individuals with certain features and tendencies to behave in a certain way - to prefer a certain pattern of behavior during the teamwork. This results from the interaction of the individual's personality, its acquired experience and, of course, also from the demands of the group, in the middle of which the team role is defined. The preference of certain team role proves the characteristics, features and preferences of behavior in the teamwork.

Color, especially if we use it as part of non-verbal communication, can become a representative of the characteristics we attribute to ourselves. Several researches prove that the preference of color is associated with the perception of one's own personality features and individual characteristics of personality (Crozier 1999; Lange and Rentrow 2007; Lüscher 1997). At the same time, color may be used as a non-verbal means of self-presentation and of attempt to obtain a positive assessment from the others, as claimed by Madden et al. (2000, pp. 90-107).

It is obvious that color preference is associated with some personality features and therefore can be used as a means of self-presentation, related to behavior in a certain situation.

The basis for our research is therefore this assumption: **Values of the preference of a certain team role, and therefore the tendency to behave in a certain way, are associated with the preference of the specified colors.**

The hypothesis of research is formulated as follows: H1: **The scale of preference of a certain team role is different in relation to the preference of a particular color.** Furthermore, the zero hypothesis H0 is formulated: **There are no differences in the preference of a certain team role due to the preference of a particular color.**

By rejecting of the zero hypothesis H0 about the absence of a relationship between prioritizing team behavior and color prioritization, it would be possible to support the hypothesis of the existence of a reflection of preferred behavior in color choice.

The team role preference was determined on the basis of the **Belbin's Team Roles Self-Perception Inventory modified by Bělohávek**, which identifies the scale of tendency to behave in a certain way in the working environment. A questionnaire published in Bělohávek (2008) was used.

The color meaning and the characteristics of preferred roles were deduced from the description of team roles (Belbin 2003, 2004, Bělohávek 2008), with the same number of characteristics being selected for each role. Based on the choice of characteristics for the preferred color, it is possible to see, what the preferred color meaning for particular respondents is, and we could compare the color's characteristics with the characteristics of respondent's preferred role.

The research file was selected on the basis of several criteria.

Due to the demonstrable dependence of color preference on the cultural context, which is published in Wright et al. (2004), there was an effort to preserve the temporal and spatial coherence of the studied group in order to avoid the influence of cultural-historical, linguistic and geographical differences in the perception of individual colors. Therefore, the Czech and Slovak MBA students of the Business Institute, s.r.o. in Prague and in Bratislava and of European School of Business and Management, s.r.o. Prague, study program Project Management and Planning, aged 38 to 46, studying in the above mentioned institutions in different cycles in September - October 2018 were included. Students of the study program are expected to have experience with the project teamwork.

In the first place, the simple random selection method was used to generate a random number set (format corresponding to the student identification numbers of the listed institutions). A questionnaire in different variants was sent to the selected file. Since the questionnaire was administered by email and the possibility of participation in the research was voluntary, we can talk about some form of sampling of respondents; only those who were motivated enough answered. In total, 250 questionnaires were sent, the answer was sent back to 76 respondents, the return of the questionnaire was 30.4%. In one case, the questionnaire was not correctly filled in, in one case the questionnaire format was not readable. Based on the reported color vision disorder, one respondent was excluded from the research. The survey was attended by 69 respondents, including 36 women and 33 men. The difference between the genders is not significant and on the base of repeated researches the significant difference in male and female color preference, except for the preference of a yellow color that men

prefer significantly less than women (Seefeld 1973, Lange and Rentrow, 2007), was not confirmed.

Considering the size of the research group, this research does not claim wide scope for generalizing the results, it may be at least a partial indicator in the population of today's generation of Czech and Slovak project managers and members of project teams. In our view, it is very difficult to investigate and generalize the results on the wider population, because the inhomogeneity of cultural and historical factors that may affect color perception would distort the results.

2.1 Methods Used

The research was carried out in two consecutive phases. Considering the already mentioned color dependence on the cultural context as well as the individual experiences, it was not appropriate to use any of the existing color schemes because they were often created in a different environment and especially in another language. For example, commonly used Lüscher's primary colors are not considered to be representative of the given color, their hue is specific (Lüscher's green is considered as blue-green, etc.). That's why a new color palette was created for our research.

A pre-research was used to select typical representatives of individual colors. The 40 respondents, coming from the same population as the research respondent's population, it means, that we can suppose a similar perception of individual colors, were asked what color they considered as "basic". Pre-research participants got acquainted with the purpose of the experiment, so they were excluded from further research to avoid potentially affecting the results (for example, the experimental expectation effect, as reported by Hendl (2004)).

The result was a list of eleven "basic colors"; white, black, yellow, blue, red, orange, green, brown, gray, violet, pink. Subsequently, a large color scale was presented to the respondents for the pre-research based on the RGB (Red - Green - Blue) color model. This model was chosen because it uses additive color mixing that better corresponds to our perceptual system and is common in computer technology (Žebrová, 2007). Respondents of the pre-research asked the question, which color they consider to be a typical representative for each verbal naming of colors. The "typical" color was chosen by more than 50% of the respondents (which was achieved only in yellow and gray, in the case of white and black it was the absolute agreement of all respondents). If none of the selected colors met this limit, we narrowed the selection of colors to those that the respondents chose in the first round and we asked the question again. The pink and violet color even after repeated attempts failed to reach any over-affinity, and therefore could not find a good representative. Therefore, these two colors were excluded from the next research phases. The color values selected in the pre-survey are listed in the table (see Table 1).

Table 1: **Typical colors**

Color	Red	Green	Blue
Black	0	0	0
White	255	255	255
Red	255	26	0
Blue	0	0	164
Green	79	164	0
Yellow	255	255	0
Orange	255	133	0
Brown	139	79	6
Grey	106	106	103

A three-part questionnaire was created to determine the color preferences and to administer the team role test. The first part was a **Belbin's Team Roles Self-Perception Inventory modified by Bělohávek**. For research, this version was deliberately chosen for several reasons. On the one hand, the Bělohávek's test does not have an ipsative character such as Belbin's test, so it is possible to achieve several high (but low) results without adversely affecting the number of points in other types. This corresponds to Belbin's concept of several (3-4) optimal team roles and, on the other hand, allows respondents to describe their own behavior without limitation. The disadvantage of this form is that an individual can stylize himself as a "superman" to achieve artificially high scores in multiple areas, or in all.

The test, questionnaire form of team role determination was chosen for several reasons; even when observed by professional and trained observers, there is a considerable disadvantage that not all individual preferences can be reflected in the specific composition of the team. In this situation, one takes a role that is best for him and for the team (Belbin, 2003, 2004), and even a good observer is unable to identify other preferences that might have been reflected in the other members of the team. In addition to lesser reliability, observation is demanding for staffing and time. The test, unlike observation, remains opened for various possible combinations of preferences in teamwork. The individual properties are judged based on the perception of their own (corresponding) behavior in the particular situations presented by the test.

The second part consisted of a projective question about the preferred color, the question directly focused on the teamwork environment was chosen to avoid the influence of other contexts and associations that could influence the preference of the color. Thus, preference becomes a deliberate, not an unintentional act and thus a form of presentation of a statement bearing a certain meaning. The suitability of the

projective question and its correct understanding was verified on a small set of 10 respondents, on the basis of which the question was modified to the final form.

There are two ways of determining the color preferences, as stated by Hulke (2005):

- By direct stimulation with color impulse - the disadvantage of this method is the bias resulting from individual color perception by a particular respondent. At the same time, since it is a direct stimulation, there are other disturbing effects of the context, surroundings (lighting, monitor parameters, color resolution etc.)
- By imagining of the colors associated with its naming - in this case, the disturbing effects of the environment are eliminated, but on the other hand, we lose control over what color the individual really represents under a certain name. Its different qualities (hue, brightness and saturation) can lead to its different conception and other symbolism.

That is why the first method - direct stimulation was chosen for this research. Respondents were directly exposed to color stimuli for each color in the same format. Because of the possible effect of the background as a context, the most common environment was chosen so that the respondents were not disturbed; white background and black border with color.

As the respondents filled out the questionnaire in an unchecked environment, the influence of other intervening factors that could influence color perception, as well as the completion of a team role test, such as lack of light, disturbing factors affecting the respondent's attention and, last but not least, technical parameters and setting up of a computer, is not possible to exclude. In an effort to address these impacts, respondents were instructed within the e-mail about the approximate duration of the questionnaire and the need to provide appropriate lighting conditions in this respect. At the same time, they were asked to give sufficient attention to the issues. A possible intervention variable in connection with lack of motivation and of time or attention is also the inaccuracy in filling in the questionnaire. The solution in this case was the already mentioned offer of evaluation of the results, which motivated respondents to answer truthfully. Dishonesty could also appear as a consequence of trying to stylize into a certain position. In this case, we assumed that stylization would be present even in color preference. This would compensate the intervening variable on both sides and the results are comparable.

The order of each color of color scheme pattern that was created in pre-research was varied in each variant to avoid the possible color preference order.

The third part of the questionnaire concerned personal data; respondent gender and the state of color vision.

The generated questionnaire was administered to respondents by e-mail. Respondents were given the opportunity to evaluate the **Belbin's Team Roles Self-Perception Inventory modified by Bělohávek** also in an attempt to improve their motivation to complete the test and thus increase the return on the questionnaires. Different versions of the questionnaire were assigned to individual respondents. To counteract the possible effect of the order of **Belbin's Team Roles Self-Perception Inventory modified**

by **Bělohávek** and the choice of the preferred color and its characteristics, half of the questionnaires were reversed; version A - BTRSI, Color preference; Version B - Color Preference, BTRSI. Together with a different order of colors, 725760 possible versions of the questionnaire ($k! \times 2$) were created. Therefore, a different version was sent to each respondent on a random basis (the only condition was the same representation of both versions).

No complete explanation of the purpose of the questionnaire was sent to the respondents, only the team role test and its options were mentioned.

Those who sent back the completed questionnaire were sent an email with a thank you and a complete explanation of the purpose of the questionnaire. After transcribing the data obtained into the data matrix and evaluating the team role test, respondents who showed interest were sent an evaluation of their test.

We have respected the Personal Data Protection Act and did not use anything to encode the data on which the respondent could be identified. We also tried to respect the ethical rules of research and the work of a psychologist working out of EFPPA (European Federation of Professional Psychologists Association) requirements.

Ethically less correct is the way of selecting respondents. In an attempt to randomize, we chose the "spam" method - an unsolicited e-mail, which some respondents could be considered harassment. This, on the one hand, reduces the motivation of respondents to respond to a similar e-mail, or to answer truthfully, and to devote enough attention to the questionnaire.

Concealment of a specific experiment goal was treated by posting a complete intent to study.

After the test was delivery, each of the respondents was identified with a code that spoke of the version of the test he filled out. The parts of the test were evaluated and converted into a data matrix. The data obtained from the questionnaires were processed in Microsoft Excel.

69 questionnaires were included in the analysis of the results. Each of the questionnaires contained a different color order, with 30 questionnaires of version A (43.5%) and 39 questionnaires of version B (56.5%).

3 Literature Review

3.1 Teamwork

The team is determined as a formal social group with knowledge and skills related to a specific field and the stated goal, which primarily mentions Belbin (2012), Kolajová (2006), Hayes (2003), Kubátová et al. (2013), Meier (2009) and Krüger (2004), and so the processes taking place in the social group are taking place in each project team. Many authors today point out that the team approach to product creation and service delivery is not only more and more frequent, but also an increasingly important strategy in terms of effective implementation of corporate goals (Bělohávek 2008, Hayes 2003, Meier

2009, Hájek 2012, Hlušička 2012). Bělohávek (2008) even talks about teamwork as a major competitive advantage; both because it is effective and, on the other hand, it is rare, which puts it on top over the finance, business strategy or technology.

As part of an effective joint solution, cooperation should take place in an atmosphere of interaction, understanding and creativity (Barták 2007, Plamínek 2009).

Knowing the personality of the individual, his uniqueness and his individuality is in this case strategically important from the point of view of managing the work process, optimizing the use of workers and preventing conflicts or eventual individual failures. The analysis of the complex of assumptions, abilities, knowledge and, last but not least, of the features and characteristics enables us to make responsible decisions about the correct selection of employees and at the same time it provides an important information to the bearers of these qualities about its qualities and possible options.

3.2 Team role

Team roles are basically the equivalent of a social role in a specific social group, the team. Individual team roles are influenced by the composition of the group, the individual characteristics and the characteristics of the individuals who make up the group (Výrost and Slaměník 2008, Kolajová 2006, Plamínek 2008). In this respect, the personality disposition and, on the other hand, the norms and expectations of the group, the team, are important.

In the field of personnel and human resource management, R. Meredith Belbin dealt with more detailed research into the issue of the different personality and effectiveness of management teams. Based on nine years of research, in which participants were subjected to a battery of psychometric tests and observation work teams, R.M. Belbin and his colleagues at Henley Management Collage identified several typical behavioral groups while working in a team later named "team roles". The team role describes some preferred behavioral patterns that individuals use to interact with others as they contribute to the problem-solving process within the group (Belbin 2003, 2012). It is not just a personality characteristic in general but an important one is a set of factors that contribute to the formation of a certain pattern of behavior directly in the context of teamwork. According to Bělohávek (2008, p. 29), who works with the M.R. Belbin model in his publications, the construct of the team role is "partly a manifestation of personality, innate characteristics and, in part, such a demonstration of experience gained". .

One of the most important elements of Belbin's grasp of the notion of team role is the fact that it is primarily about the individual's preferences, whether determined by personality factors or experience.

Each of the roles is a sum of other abilities, skills, and behavioral traits, and hence the potential strengths and weaknesses that may emerge in working together. These preferences for a particular behavior are not unchanging and are not the same for each situation. The individual characteristics and roles are theoretically unambiguously differentiated, but Belbin himself (2003) admits that in a practical life it is a complicated

process; individuals rarely come up with a stable pattern of behavior in situations requiring teamwork. Most populations have 3-4 preferred roles that they can take or change based on the situation they are in.

Therefore, the team role does not represent a distinct personality type, the individual characteristics may occur together (Kolajová 2006, Bělohávek 2008, Plamínek 2009).

3.3 Color

"Color is our earliest visual impetus and plows its way into the lowermost layers of the symbolic language of mind" (Kenner, 2007, p. 11). It is an attribute that we register as one of the first, often even before we ever find out what we are actually looking at (Veverková, 2002). It is generally known that color is not the property of the object we see but the attribute of light that reflects from the object and falls on the retina of a certain wavelength. However, perceiving a certain wavelength spectrum as a spectrum of differentiated colors is not based on any physical delimitation that would uniquely determine the boundaries for that color - perception of a particular color and its distinction from others and the naming is the ability of the human mind, the human brain (Atkinson et al 2003). Schirillo (2001) thinks this ability is one of the most exciting results of our mental activity.

In practice, there are often very clear instructions on the meanings of individual colors and their interpretation based on experience or different stereotypes (Brožková 1982; Sasaki according to Bilgin and Isler 2008). In the field of teamwork, it is especially literature dealing with correct performance, self-presentation and effective nonverbal communication techniques, such as Tegze (2003), Tee (2005) and Lewis (1998) and others. These, however, present color particularly in connection with clothing and suitable color combinations.

3.3.1 Color preference and personality

The use of color as a mean of value transmitting, that testifies about us to people around us, allows to present our own "I" to others, speaks about the extent of our self-evaluation (who I am and how I try to be perceived), Schneiderová (2008) says. We assume that the neighborhood perceives and understands these forms of presentation approximately on the same level. There is a close context between color and personality in this respect. There has been evidence of this context since antiquity. The most well-known model in this respect is originally the Hippocrates model of four temperaments, to which four representative colors were assigned (Hulke 2005; Lüscher 1997).

The combination of color and personality or certain characteristics is not a matter of the past. As observer, we can derive and we really derive, either rightly or wrongly, the characteristics of others based on such information and suggestions as appearance, visual description, clothing, furnishings of bedrooms and offices, preferences of musical style or color (Gosling, et al., 2002; Gosling and Vaziri 2004 according to Lange and Rentrow 2007, Rentrow, 2003, Lange and Rentrow 2007, Monnet 1997).

One of the first to point out the possible context between color preference and personality differences was Eysenck (1941 cit. Crozier 1999) or Lange and Rentrow (2007), who linked extroverts with clear and pure colors, while the preference of introverts was on the dull colors side.

The most famous supporter of the idea that personality features and preferences of colors are together clearly linked, is M. Lüscher (1997), who based his research on assumes that individuals with similar color preferences also have similar personality characteristics. The psychological response to individual primary colors (blue, red, yellow, and green) is intended to reflect the psychological needs of the individual, says Lange and Rentrow (2007). The question of whether and to what extent color preference is universal in view of the cultural context and personal experience is still the subject of research, for example, Crozier (1999) or Taft (1997 in Crozier 1999). Lüscher (1997, p. 118) speaks in this respect about the unambiguous similarities of the feelings that different people create in individual colors, regardless of the context. On the other hand, he recognizes the subjective distinct feelings of sympathy, indifference or antipathy that a person has against a particular color. We can say that he defines the objective (on culture or context independent) and subjective (dependent on personal experience) quality of the perception's component, of feelings that particular color evokes in us. His color psychology is based on the absence of differences in the objective component of perception of individual colors. Crozier (1999), on the other hand, reflects the findings of several researches concerning the preference of colors and in the connection with personality characteristics as not unambiguous. The only repeating result is the approximate order of six basic colors (blue, green, red, yellow, black, white).

Except the context on unconscious mental content and processes, as is the case with Lüscher (1997), the researches into the relationship between personality and color are focusing on the preference of colors as a conscious reflection of certain motives, values. In spite of this, however, the authors often achieve different results - not always the context between color preference and a certain personality characteristic is proven, says Lange and Rentrow (2007). The authors report that the difference in the results of similar research is due to the fragmentation of the problem (piecemeal problem). According to them, color preferences are not "linear," but one personality features can testify to more than one path, the "many-to-one" color preference. Verifying hypotheses based on this strategy they came to the conclusion that the preference of certain color is significantly correlated with Strong's (1931) Basic Interest Scale and, to a lesser extent, with Cattell's (1957) 16 Personality Factors.

In any case, it is possible to claim that there is a context between the preferred color and certain personality characteristics. Based on color preference, we can, to some extent, consider the personality of the other person.

4 Results of research on Belbin's team role and colors preference in the project team

Plant (PL) is the role significantly more than the average preferred by the respondents who chose the yellow color. On the other hand, lower values than the rest of the group

were achieved by the green group (the result does not exceed the level of statistical significance).

Co-ordinator (CO) and **Resource Investigator (RI)** are more than the other preferred team roles for respondents who have chosen the yellow color. In the case of Resource Investigator, however, the value does not reach the level of statistical significance.

Shaper (SH) is the preferred team role for the group with the selected red color. On the contrary, for green, the preference of this team role is lower.

Roles **Monitor Evaluator (ME)** and **Complete Finisher (CF)** did not achieve significantly higher or lower preferences in any of the preferred color groups.

Role **Teamworker (TW)** achieves higher preference for a group of selected green and yellow colors. On the contrary, the red color preference of the group is significantly lower.

Roles **Implementer (IM)** and **Specialists (SP)** were more than preferred by a group of respondents who chose a blue color.

Based on the results of the data analysis of 69 respondents, it can be argued that the **hypothesis has been confirmed respectively the zero hypothesis about the absence of differences in the preference of the team role relative to the preference of a particular color is refuted.**

The first result of the research described above was the determination of the color scale, which offers a different set of typical representatives of individual colors: red, blue, green, yellow, gray, orange and brown. Given the size of the sample (40 respondents) and the narrow demarcation of the population, these results cannot be generalized very broadly. We have already encountered a problem of individual perception, categorization and naming of individual colors in pre-research. The exclusion of pink and violet color from the impossibility of reaching any match in identifying typical representatives of these two colors indicates that colors are not predefined categories, and the method of categorizing of individual colors is dependent on subjective experience. It is possible that, if a larger research team were used in this respect, the pink and purple consensus could have been reached. However, the increase in the sample examined would reduce its homogeneity and the observed differences could even be greater.

Another finding that supports the idea that color really is a category that influences our perception and assessment of people, things, phenomena, could be the difference between returns of the A and B versions of the questionnaires (13% difference). The version was rated first in a team role test, while the second version began with the prioritization of colors, colored surfaces. One of the likely explanations for this difference is the ability of color to attract attention and be the first visual signal we evaluate and on which basis we decide. It is possible that respondents who decide on the first impression of filling or unplanned test were more motivated by the B color scheme than the black-and-white A version after opening the attachment.

From the results of the team role test, it appears that in a given selection of respondents the roles preference was approximately normal, and therefore the group surveyed

approaches to the characteristics of the normal distribution existing in each population. Even though the respondents were able to get a total number of points, the average number of optimum roles, corresponding to more than 10 points, was only 2.34, less than Belbin declared (3-4). This means, on the one hand, that in spite of the possibilities, the respondents were critical of filling out the questionnaire. This fact also demonstrates the suitability of the respondents or the usefulness of the test results as a motivating factor.

Within the preference of individual colors, the most numerous group was made by respondents who preferred the green color. This also confirmed the results of previous studies, which speak of the fact that the most preferred color of the adult population is blue. Blue was second, but the difference between green and blue was not significant, and it is possible that with the larger sample examined, the ratio would turn in favor of the blue color.

On the other hand, the colors gray and brown and white were chosen little, or not at all. These are colors that do not generally belong to the first bars in the preference of individual colors (Crozier, 1999). Here, a corresponding explanation could also be the linking of the projective question to the preference of colors that evoked entry into the teamwork, with the meaning attributed to these three colors. Attempting to present yourself in the best possible light has probably led respondents to prefer color to more pronounced.

In examining the context of preference between individual team roles and color preferences, a significant difference was found in eight cases.

The research results confirm the existence of a context between color selection and preference for a particular behavior. It is possible to support the claim that color or color preference may reflect the preference of certain team roles and vice versa. Looking for a possible originator of this context, it is important to realize that as a preference for a certain team role, so the choice of the preferred color that individuals have to represent in the working team environment, are essentially forms of behavior in a specific social interaction situation. Personality as a dynamic source of individual behavior is involved in their relationship (Drapela, 1997). Both the preference of team roles and colors reflects some of the personality characteristics. Individuals with similar characteristics similarly prefer the team roles, and given the relative versatility (depending on the context) of the meanings of the individual colors, a particular color may carry similar characteristics (in this respect the context between personality features and color preference was supported by several researches, e.g. Bilgin and Isler (2008) or Wolfarth (1985 by Viving 2006).

The second important factor that could influence the found results, arises from the projective issue of color preference and of the context of entry into a particular social situation. The preference of color could be influenced by the effort to present yourself in front of the others in the best possible way and thus to choose a color that carries "good" and "positive" characteristics. The preference of the team roles detected on the basis of the self-perceptive inventory gives the respondent the opportunity to present himself so as to generate a good impression and a positive expectation (Výrost and Šlaměník 2008). Rozvadský Gugová (2014) states that the Self-concept expresses the

unity of body and soul consistency and human continuity. It develops in an individual interaction with the world. Self-image can be defined as an attempt associated with the overall vision of yourself. It can be divided into three components: cognitive - how do I see myself, what I know about myself, emotional - how they are being evaluated, the degree of correlation between real and ideal me, how I am and what I want to be and ultimately regulative - how to handle one's own personality.

Significance is associated with a specific color, which also reflects the conscious or desired characteristics. Also, an important factor is the possibility that color does not serve as a representative of the currently perceived status of personality, but as an attempt to present yourself in the group in the best light. Given that, the specific significance, that is unknown to a given person, is unknown, it is difficult to interpret the context between preference behavior - holding a certain team role and prioritizing color at the level of individual meanings. Research results show only a combination of color preference and a specific team role, they do not answer directly to the question why, although they provide some guidance.

The yellow color was preferred by respondents who, more than others, prefer the role of Plant (PL), Co-ordinator (CO) and Team Worker (TW). Just below the level of statistical significance, the Resource Investigator (RI) role remained. These roles, apart from the Plant, are included in the Belbin's concept among "people-oriented" roles. They have a common ground in focusing on working group relationships, the ability to communicate, motivate, and diplomatically respond to the situation. If we look for common characteristics with the Plant role, it is the flexibility and speed with which all these roles can handle the new situation. These roles are not characterized by knowledge or experience, but rather by talent and the ability to adapt. In this respect, can be found a parallel with the Lüscher characteristic of yellow as a color associated with dynamics, change and freedom, especially with the Plant's characteristics, as well as the Resource Investigator. Equally satisfying is the junction of yellow with creativity, lightness, resourcefulness, intelligence and clarity.

High ranking in the role Teamworker is associated with a green color preference. Green is rated stable, strong, persistent and tough. These characteristics are no longer easy to relate to the role of the Teamworker. Possible connections are calm, creativity and peace, which can be combined with diplomacy and the ability to adapt quickly and calm others. Given the low preference for the role of Plant and Shaper, the similarity of individual characteristics is more difficult to find than for other roles.

An interesting combination is the result of the group preferring the red color, which was associated with higher values in the role of Shaper (SH) and vice versa in the role of Teamworker. From the characteristics of the roles arises their contradictory position in the relation to the others, to the degree of hardness, to orientation and values. In favor of the red link and the role Shaper also speaks psychophysiological effects of this color - an increase in arousal, nervousness, as Arnheim (2004), Stone (2001, Lange and Rentrow 2007) or Kohoutek (2002) cited. Lüscher (1997) combines it with a sense of self-confidence and self-power, which further contributes to this connection. With the role of Teamworker who is diplomatic, sensitive, assisting, we cannot find many common characteristics.

The last distinct connections are the higher preference for Implementer and Specialists in the context of blue color preference. The common characteristic of both roles is the ability to work systematically and independently, critically thinking. From communal meanings, this combination would promote the meaning of blue emphasizing tranquility, isolation, solitude. Maddon's (2005) interpretation of blue in the context of communicative people working on labor relations has not been confirmed.

However, we must not forget that similar contexts are not the exact confirmation of the fact that the colors really have this meaning for the individuals who have selected them. The importance of color cannot be separated from its affective and psychophysiological effect, so the preference of color is the involvement of personality factors, culture, experience and physiological effect of individual colors.

5 Conclusion

The hypothesis that there is a relationship between the certain team role preference and the preference of a certain color is confirmed. These results are probably related to the same origin of team role preference and color preference in the personality characteristics and complex of each individual's experience. The perception of color preference and of team role preference we consider as a selection clearly dependent on the context. The color can be a good means of sharing and presenting of certain information to our surroundings on the base of the context in connection with subjective processing, experience and meanings, those are attributed to the certain color in a given cultural and historical environment. In this respect there is lot of researches (Eysenck 1941; Bakker, van der Voordt et al. 2015, Hanafi and Sanad 2015, Lange and Rentfrow 2007, Schaie 1966, Kaya and Epps 2004) dealing with the color preferences and particular personality characteristics.

To what extent is the process of color meaning attributing connected to personality, and to what depth the preferred color and its meanings reflect the characteristics of a team role or personality itself, is a matter that would be worth exploring.

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Soft Skills: The Hard Core of the Human Centered Knowledge Economy

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Abstract

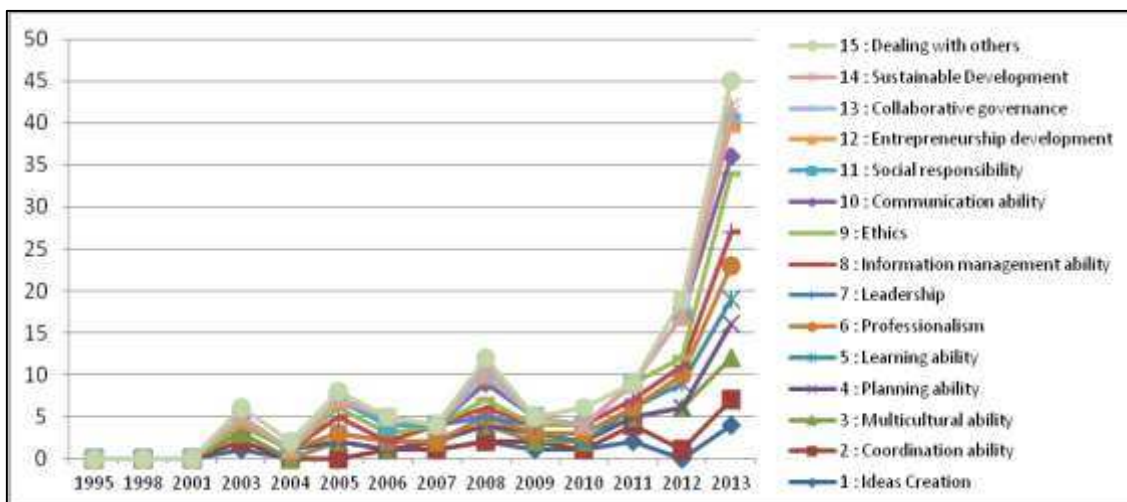
Technology is changing the world and deeply impacting economies, people and societies. Yet large segments of education and the workforce remain anchored in unwavering outdated hard disciplinary approaches that are undermining productivity and obstructing the potential of people's contribution and the need for change. Postponing attention on the paradigm shift from the hard resources and process focus to the development of human capital secured in talent discovery and cultivation may cause significant drawbacks. The paper presents a way out of this dilemma by suggesting a common denominator of new methodologies in training, coaching and deployment of soft skills: The outcome will only be beneficial if they are not taught and developed on a standalone basis, but in close junction with hard-core standards in management and performance assessment. The topic is addressed from the dimensions of education, industrial/administrative implementation and business ethics.

Keywords: Soft skills, workforce, human capital, human centered management, knowledge economy

Introduction:

The growing significance of the soft skills topic can be demonstrated by inspecting peer-reviewed papers in management journals. Using database "SCOPUS" by Elsevier (<http://www.elsevier.com/online-tools/scopus>) to search papers with "soft skills" in titles, abstracts or key-words, 15 soft skills concepts came up in a recent research (Fig. 1).

Figure 1: Evolution of main soft skills concepts in management literature (number of topics)



Source: Massaro, M., Bardy, R., & Garlatti, A., 2016.

The following list (Table 2) gives a brief overview of how the concepts are used in the papers^v.

Table 1: Definitions “soft skills” in the literature

“Soft skills” items / field	Authors recently published	Main words/concepts used by authors
Idea creation ability	Bailly and Léné, 2013; Bajada and Trayler, 2013; Baron and Morin, 2010; Barraquier, 2011; Bodell, 2014; Griffith and Hoppner, 2013; Kahlon, 2013; Massaro et al. 2014	Problem Solving, Creativity and Self-Confidence: Intuition, Flexibility, Imagination, Ingenuity, Inventiveness, Creativity
Coordination ability	Barraquier, 2011; Bedwell et al., 2013; Falconer and Pettigrew, 2003 Kahlon, 2013; Parente et al., 2012; Tyagi and Tomar, 2013; Weber et al., 2009	Collaborative Skills, Ability to Communicate and Interact with Others, Interpersonal Relations and Communications, Work in Groups and Team, Collaboration, Cooperation, Help, Contribution, Communication, Dissemination, Influence, Relationship Connection, Correlation, Team Environment, Staff, Units
Multicultural ability	Andrews and Higson, 2008; Bailly and Léné, 2013; Bajada and Trayler, 2013; Barraquier, 2011; Bodell, 2014; Griffith and Hoppner, 2013; Haro and Turgut, 2012; Massaro et al., 2014; Mirchandani, 2012; Neely and Tucker, 2013; Rao, 2013a; Nilsson, 2010; Tilley et al., 2012; Velasco, 2012	Global Expertise / Multicultural, General Culture, Networking, Global Context, Character, Complexity Skills, Languages, Interaction, Knowledge, Learning, Scholarship, Social Network, Workplace, Environment, Personality, Inclination, Mind, Mind Multiplicity, Variety, Variability, Multiplicity
Planning ability	Ashcroft, 2004; Bailly and Léné, 2013; Bodell, 2014; Falconer and Pettigrew, 2003; Griffith and Hoppner, 2013; Rao, 2013b; Tyagi and Tomar, 2013; Weber et al., 2009	Ability to cope with Uncertainty, Plan, Strategy and Strategic Planning, Change Indeterminacy, Vagueness, Indecision, Ambiguity, Organization, Planning, Design, Skills, Tactics, Cunning, Change, Change, Renewal, Innovation

Learning ability	Bell, 2012; Bixby, 2012; Crosbie, 2005; Griffith and Hoppner, 2013; Haro and Turgut, 2012; Kahlon, 2013; Neely and Tucker, 2013	Learning to Learn, Willingness To Learn And Accept Responsibility, Acquire, Understand, Learn, Experience, Aspiration, Awareness, Maturity, Will
Professionalism	ElShenawy, 2010; Fletcher et al., 2014; Garwood, 2012; Griffith and Hoppner, 2013; Kahlon, 2013; Rao, 2013b; Tyagi and Tomar, 2013	Professionalism, Reliability, Stress Management, Time Management, Seriousness, Commitment, Competence, Trust, Secure, Stress, Endeavors, Urgency, Independence, Run, Self-Management
Leadership	Barraquier, 2011; Bell, 2012; El Shenawy, 2010; García-Sánchez et al., 2013; Kahlon, 2013; Rao, 2013b; Tobin, 2007; Trompeter et al., 2013	Employee Motivation, Leadership and Influence Boost, Encouragement, Management, Command, Direction, Principles-Based, Governance
Information management ability	Walker et al., 2008	ICT Competences, Decision-Making, Information Management, Boost, Encouragement, Management, Command, Direction, Principles-Based, Governance
Ethics	Baden, 2013; Bajada and Trayler, 2013; Barraquier, 2011; García-Sánchez et al., 2013; Kahlon, 2013; Rao, 2013b; Shadnam and Lawrence, 2011; Soltani, 2014; Su, 2013; Tilley et al., 2012; Trompeter et al., 2013)	Ethics, Morality, Integrity, Customs, Norms
Communication ability	Fletcher et al., 2014; Garwood, 2012; Kahlon, 2013; Mirchandani, 2012; Parente et al., 2012; Robles, 2012; Sullivan and Kedrowicz, 2012; Tyagi and Tomar, 2013	Written and Verbal Communication Skills, Communication, Relationships
Social responsibility	Baden, 2013; Bailly and Léné, 2013; Bajada and Trayler, 2013; Kahlon, 2013; Walker et al., 2008	Social Responsibility, Stakeholder Integration, Sustainable, Development, Community Relations

Entrepreneurship development	Andersen et al., 2006	Guidance, Entrepreneurial Abilities, Creativism
Collaborative governance	Shih et al., 2010	Participative Competences, Humanistic, Management, Bottom-Up Involvement, Alignment, Interaction
Sustainable Development	(Baden, 2013; Clarke, 2008)	Integrative Resource Use
Dealing with others	Bailly and Léné, 2013; Baron and Morin, 2010; Bedwell et al., 2013; ElShenawy, 2010; Falconer and Pettigrew, 2003; Kahlon, 2013; Parente et al., 2012; Robles, 2012	Rule-finding, Discourse, Dealing with Conflictive Environments, Reflection, Inquiry and Advocacy, Involvement, Interaction, Alignment

This list of definitions reveals the width of the abilities that are needed for successfully working and leading in competitive environments. But there is an additional requirement: It is about alignment with the demands of the Knowledge Economy. The soft scores must be integrated with the hard scores of physical and social sciences to a much deeper extent. For this, it is essential to connect soft skills education and training to a broad spectrum of applications covering all sectors of the economy and society. Only then will the development of soft skills facilitate social and economic progress, because only then progress will be propelled by the empathetic people who have the capacity to seek and optimize opportunities in the global VUCA (volatile, uncertain, complex, ambiguous) environment in our fast-changing world (Ochoa, Lepeley and Essens 2018). Moreover, studies report that today in less than a decade, students forget hard skills they learned in business schools because they become obsolete (e.g., Teichler 2009, OECD 2012). In contrast, soft skills are long lasting, transferable across different industries and cultures, and applicable in countries around the world.

A Soft Skills Framework for Conducive Alignment with Hard Score Knowledge

Aligning soft skills training and development with the demands of the Knowledge Economy requires a new rationale that corresponds with the fundamental principles of human centered management, i.e., emphasizing human relationships, placing people at the center of concern, and paying attention to issues of trust and emotion. We present a model that accentuates the urgency to integrate Soft skills along the continuous stream of education and of workforce training. The effort must span from the lowest education levels to executive suites to achieve that team building is strengthened, organizations are becoming agile and that engagement and work satisfaction are enhanced. This will boost individual and organizational performance and productivity in countries around the world. One example that this foundation reaches beyond the Western world is the accent which Chinese business literature has laid on the human centered paradigm early on (see, e.g., Sheng, 1979; Menkhoff, 1993).

The framework we propose is based on a research continuum of soft skills using multi-dimensional projections and multidisciplinary approaches on how to complement soft skills with deployment of hard skills for improving outcome and results of work in any discipline. We believe that research on soft skills, placing them as central elements of management in the 21st century have not received necessary attention (see Murti 2014, Cinque 2016), and this is largely so because soft skills involve more complex human behavior and are more difficult to teach, transmit and measure than hard skills. Yet it is increasingly evident that without soft skills the performance of people in the Knowledge Economy is curtailed as is organizational competitive level. Moreover, since the “hype” towards Artificial Intelligence suggests that this can substitute hard human skills to a significantly higher extent than soft skills, there is again a tendency to neglect the topic (Brundage et al. 2018). But soft skills will remain strengthening human participation in production processes.

Multidisciplinary literature confirms a fast increase in the exploration of soft skills (as elucidated through Table 1), but practical research is lacking (Adams 2014, Cerezo-Narváez et al. 2017), and it is necessary to bridge deep gaps between disciplines, sectors and industries. Therefore, we concentrate on applicability in business, the workforce in general and in government/ public service institutions. The main concern is that soft skills, like other cognitive skills, cannot be merely memorized but must be developed, practiced and strengthened over time. And we wish to point out that the impact of soft skills can only be properly demonstrated if including results of effective integration with hard skills. This comprises assessment of individual and organizational indicators and performance standards, output/outcome, decentralization, and constructive competition. Our argumentation is going along the following lines:

Performance standards - Introducing collaborative methods to collectively develop and implement objective performance measures identifying clear goals, targets and indicators for improvement. Criteria for performance assessment leading to output / outcome assigning increased individual responsibility through decentralization and internal collaborative competition.

Output/outcome - Targeting and engaging all stakeholders concerned with assessment to develop and implement processes and standards to measure output and outcome. Assessment criteria must be based on a balanced mix of qualitative and quantitative performance indicators.

Decentralization - As staff members become empowered and encouraged to use their Softs Skills, the expectations are set for a shift from a hierarchical management system to a decentralized system in which managers are increasingly responsible for output/outcome to make the organization agile expediting change the workforce needs to optimize benefits and minimize costs of unavoidable disruptions.

Constructive competition – Enhancing professionalism, increased reliability, learning to cope with uncertainty and work under pressure, upgrading long-term planning competencies and communication skills, benchmarking and constructive competition between departments or agencies with high potential to be effective incentives for improvement aiming to lower cost of production, eliminate waste and achieve quality standards of work performance and service delivery.

Tangible results like those listed above will also depend on the appropriate instrumentation of communication skills. They need to obey an ethical principle, which is universal moral respect. This implies recognizing the right of all human beings to speech and actions to participate in any conversation. The principle of egalitarian reciprocity in conversations is about providing symmetrical responsibilities and rights to all speakers; to give everyone a chance to initiate new topics and reflections about conversations (Benhabib 1993). These “rules of the game” are to be embedded in soft skill- and communicative abilities in the workforce and society.

In order to analyze how both the soft and the hard core-sides of soft Skills implicate, a survey was undertaken with participants of an executive education course. “Performance” was measured proxy by assessment of tangible and intangible outcomes of business processes and stakeholder relations that were drawn on human centered management.

A Survey on Soft Skills Outcomes

The survey set out from the question of whether soft skills connect to business processes and to stakeholder relations and how they are built and managed in a firm. There should be impacts on corporate performance as, per minimum, soft skills are likely to encourage open communication, problem solving, knowledge sharing and creativity among employees (the organizational capital); enhance interactions and relationships with suppliers, customers and other stakeholders (the relational capital); and retain talent (the human capital).

Another input into the survey was the issue of how knowledge on ethics transcends into business behavior and business processes. The knowledge built up from business ethics can help to improve human centered decision-making by providing managers with the appropriate knowledge and tools that enable them to correctly identify, diagnose and analyze human relation problems and dilemmas. An ethical concept of how to deal with knowledge needs to depart from defining knowledge as *justified true belief* (Goldman 1979) and knowledge creation as the “dynamic human process of justifying personal beliefs as part of an aspiration for the truth” (Nonaka 1994, p. 15).

The ethical concept of knowledge management transforms into a practical panorama through five fundamental effects (McElroy, 2003):

Overcoming tacitness and complexity within and between corporations – individuals must be guided in their various roles to fundamentally rethink their work patterns, relationships and cognitive frameworks.

Extending enterprise and networks – be it “knowledge communities”, “knowledge chains”, “knowledge suppliers,” or “knowledge markets” (Gilsing, 2006), the foremost requirement is that their participants interact free from affectation or disguise; without this, all modern networking techniques will not produce the desired outcomes.

Practicing a “learning organization” (Senge 1994) – each person dealing with others must command personal mastery, mental models, shared vision, team learning, and systems thinking.

Working with multi-faceted and parallel approaches (“ambidextrous learning”; Kang and Snell 2009) – progress can be achieved only by simultaneously exploring new knowledge domains while exploiting current ones (Kang and Snell 2009).

Maintaining continuous connectivity and communication – beyond state-of the art technology, a methodical approach is required for updates, feedbacks, inclusion in surveys, etc.

All five aspects delineate essentials of business ethics and will level up human capabilities in a firm and its organizational structure. It will thus alter a firm’s *intellectual capital* of which *human capital* and *structural capital* are the two major categories, with *relational capital* as a third category of its own (see, e.g., Sullivan 2000, Firer and Williams 2003). Structural capital has been divided into the two subcategories of organizational capital and customer capital (Edvinsson and Malone 1997; Bontis 1998); however, this composition is mainly applied to serve the purpose of attempting a valuation of intellectual capital (Ariely 2005). When using a categorization that places relational capital at the side of structural and human capital, we get closer to corporate strategizing: The role of all stakeholders is taken into account explicitly (beyond just “customer capital”), and when corporations earnestly consider stakeholder interests, we arrive at a view on stakeholder relations that has been called a “synthesis of ethics and economics” (Jones 1995). This instrumental approach, rather than a descriptive or a normative approach, is based on the connections between stakeholder management and the achievement of corporate goals, most commonly profitability and efficiency goals but ethical goals as well (Donaldson and Preston 1995). The argument is for stakeholder management to be both a means to an end, contingent on the value of stakeholder relationships to corporate success, and a means to deploy instrumental ethics as an addendum to the rule of creating wealth. This makes ethics a business case: managers perceive that “good ethics” is “good business” and that employing ethics in stakeholder relations increases firm value (Solomon 2007; Quinn and Jones 1995).

Making the participants aware of the issues and interrelations laid out in the preceding paragraphs was one fundamental step before conducting the survey. The other fundament was a model that depicts the interaction between ethical/moral reasoning and outcomes of business activities.

The ingredients of human centered enablers of corporate performance: A model of interaction

The model that was presented for the participants of the survey had been solely conceived for surveying the views of high-level managers attending the executive education course. It may be valid in a European and perhaps in a North American context, but not in others – even though, as said in the Introduction, human centered management is a distinctive feature, for example, in Chinese businesses. Another disclaimer would be that the proof of the model’s validity may have been influenced by

the setting of the survey: it was a course on ethical leadership, and this certainly influenced the answers to the questionnaire.

The model endeavors to measure the effect of human centered management in a firm by gauging the impact of an awareness of soft skills deployment on business processes and stakeholder relations.

Four ingredients to corporate performance are shown in the model:

(1) A code of ethics that serves to guide employees', managers' and executives' behavior, (2) conscientious management of stakeholder relations, (3) knowledge management procedures that are enhanced by the mutual respect, and (4) business processes that are conducted along the same lines. The four interact with each other and with corporate performance.

The term "corporate performance" is not defined in the model – it may represent financial performance or market share or share-value. This ambiguity allows a flexible application, above all, when used for a qualitative investigation. The model is shown in Figure 2:

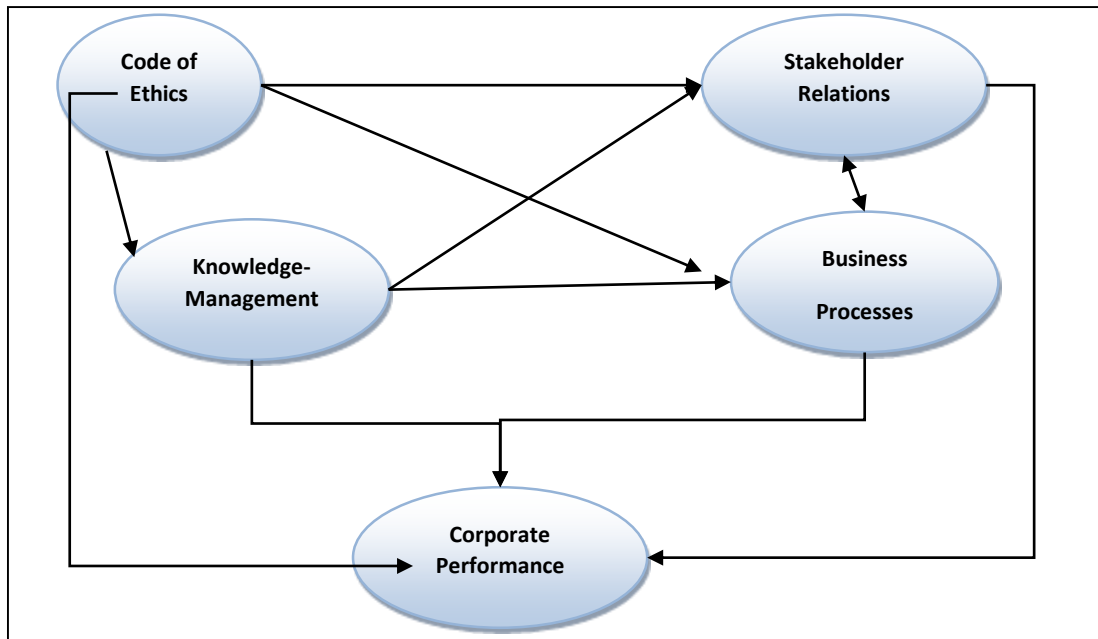


Figure 2: Direct and indirect effects of soft skills elements on corporate performance Source:

From there, the first four questions were drawn:

- Q1: *How do code of ethics statements affect business process performance?*
- Q2: *How do code of ethics statements affect stakeholder relations?*
- Q3: *Is there a relationship between code of ethics, soft skills like communication, creativity enhancement, etc. and knowledge management?*
- Q4: *How do code of ethics statements affect overall corporate performance?*

Likewise, it is assumed that knowledge management procedures which are enhanced by soft skills will improve business process performance and also have a direct effect on overall corporate performance.

This produces three more questions:

- Q5: *How does soft skills-enhanced knowledge management affect business process performance?*
- Q6.1: *How does soft skills-enhanced knowledge management affect overall corporate performance?*
- Q6.2: *How does soft skills-enhanced knowledge management affect stakeholder relations?*

It is also assumed that conscientious stakeholder management has an effect on business processes and that, vice versa, business processes that are enhanced by soft skills affect stakeholder relations. Similarly, conscientious stakeholder management has a direct effect on corporate performance.

The corresponding questions are:

- Q7: *How do soft skills-enhanced stakeholder relations affect business process performance (Q7.1)? Is there a reverse effect as well (Q 7.2)?*
- Q8: *How do soft skills-enhanced stakeholder relations affect overall corporate performance?*

An unmediated effect is assumed for business processes: if they are conducted in alignment with corporate ethical standards, corporate performance is affected directly:

- Q9: *How do soft skills-enhanced business processes affect overall corporate performance?*

The questions were submitted to several groups of executives attending an ethical leadership course in Switzerland by way of a questionnaire they received at the end of the course. The survey followed a self-assessment approach based on a scale of 1 to 5, where respondents were asked to assess their opinion on the effects of the ethics code in their firms (all respondents' firms have a written ethics code), of their knowledge management procedures, of their stakeholder management and of their business processes.

The main result of the survey is reproduced in Tables 2 and 3. Quantitative statistics are not given here - for a detailed discussion of the results see Bardy 2015. But the tables delineate quite distinctly to where ethical leadership and knowledge management that is enhanced through soft skills can lead with regard to process performance, overall performance and stakeholder relations.

Table 2: Soft Skills Effects (I) on Business Processes (Source: Bardy 2015)

<u>Description</u>
<i>Business Process Performance</i>
Effects in terms of less friction at process interfaces
Effects in terms of increased speed of business processes
Effects in terms of improved output quality
Effects in terms of increased process re-engineering efforts
Effects in terms of less costly processes
Effects in terms of higher transparency of business processes

Description

Stakeholder Relations

Effects in terms of more dialogues with stakeholders
Effects in terms of stakeholder groups reporting more issues of affectedness
Effects in terms of more social networks connecting with the corporation
Effects in terms of customer management processes becoming more transparent
Effects in terms of supplier management processes becoming more transparent
Effects in terms of industrial relationship processes becoming more flexible

Table 3 Soft Skills Effects (II) on Knowledge Management and Corporate Performance
(Source: Bardy 2015)

Description

Effects in terms of

... having knowledge management procedures implemented that are clearly connected to what is said in the ethics code about how to apply communicative skills and respect for others;

... clearly relating that implementing a code that spells out how to apply communicative skills and respect for others has improved overall corporate performance directly;

.. the statements how to apply communicative skills and respect for others on producing an indirect effect on corporate performance through realizing improved knowledge and business process management.

In summarizing the results with regard to business processes, the survey reveals that there are effects in terms of higher transparency, of less friction at process interfaces, of increased speed of business processes, of improved output quality and of less costly processes and in terms of increased process re-engineering efforts. As far as stakeholder relations are concerned, effects were found in terms of more dialogues with stakeholder groups, of stakeholder groups reporting more issues of affectedness and effects in terms of more social networks connecting with the corporation. Combining processes and stakeholder relations, there are effects in terms of customer and supplier management processes becoming more transparent and effects in terms of supplier management processes becoming more transparent as well as effects in terms of industrial relationship processes becoming more flexible. The use of this can be threefold: (1) for the theoretical discussion, (2) for the teaching of business ethics, and (3) for practical consequences within corporations.

Widening the Perspective

In the survey that was exhibited above, implicit relations between soft-core and hard-core knowledge were displayed. But there are very explicit relations as well. The effects of soft skills on mastering hard-core knowledge are often emphasized in studies that exhibit the perception of business executives. An example is Robles (2012). The survey conducted in this study not only confirms our own findings that integrity, communication, courtesy, responsibility, social skills, positive attitude, conceptual thinking, flexibility, teamwork, and work ethic are perceived the most important among corporate leaders; it also infers that in many workplace situations hard skills alone may

be meaningless without soft skills. This relates, e.g., to the effect which conceptual thinking has on collecting and organizing information for planning and budgeting, or to the routines of software testing that need positive attitude skills towards the software developers (Robles 2012, p. 460). All of this, though, is connected to soft skills training, which takes us to the broader aspect of education.

It is soft skills education that will help businesses and other institutions to cope with the changes brought about by the rapid spread and acceptance of globalization and the enormous developments in information technology. Education, here meets must challenges which are similar to those encountered by business. At the core of these challenges is the grudging acceptance that education, training and in general the focus of our educational communities preparation for our workforce and business focus of in service training have been focused too narrowly on the technical skills and traditional business techniques. As soft skills are becoming recognized to be missing in workers across all disciplines and communities, they are as well recognized to be the “glue” that ties the traditional skills together. And they are indispensable as they can help with the mobile and changing attitude of the workforce by assisting with changing jobs, evolving processes and finding solutions for the new desire for work/life balance. Business schools that really wish to prepare future managers in different disciplines must close the gap between the skills acquired by its graduates and the skills required by the global markets. For academia to respond to these external stakeholder needs curricula must be reexamining in light of how degree programs, particularly in management, are preparing students for new demands of the workplace. One example of the issues to be encountered across several disciplines is Mohamed and Lashine’s (2003) description of the accounting education providing students with the knowledge and skills that raise their competency level. Current accounting education and the skill levels of accountants are not in line with what is required in the environment of global business where, e.g., cultural differences have a strong influence on the application of what is deemed to be uniform standards. This has been a long-standing issue (see Beechy 1999), but it has taken several years to come up with answers that include the soft skills side as well (see, e.g., Cole, Branson and Breesch 2012, Haller and Wehrfritz 2013).

A strategic plan, in general, is needed for education of whichever kind to close the gap between the acquired and required skills. Many higher education institutions include what is called elements of employability skills within their curricula. However, employers continue to report that graduates are not ready for the world of work, and lack some of the most basic skills needed for successful employment. Research into why this might be abounds from the perspectives of multiple stakeholders, made up of government, employers, higher education institutions and graduates. One researcher, Tymon (2013), reports the views of over 400 business studies, marketing and human resource management undergraduate students about employability. Findings suggest there is only limited alignment between the views of students and other stakeholder groups. So the question is raised as to whether undergraduate students are engaged with employability skills development. This could be an important clue, because learning theory tells us that motivation and commitment of learners is an essential prerequisite for effective outcomes. They report differences between first, second and final year students, which could explain an observed lack of engagement with employability-related development.

In the “hard-skills world” of computer programming, as the competition increases, the development of skills leading to increased job performance becomes more important for these employees. Research by Bailey and Mitchell (2006) has identified a combined skill set of technical, business, and soft skills needed by computer programmers. Two hundred twenty-seven IT professionals evaluated the knowledge, skills, and abilities needed by computer programmers via a web-based survey. Findings indicated that although an eclectic mix of skills is needed for computer programmers, technical and soft skills are viewed as more critical than specific business skills by IT professionals who have programming experience. In addition, the more broad-based skills, which cut across languages, platforms, and tools, are viewed as most important. The identified skill set can be used as the foundation for designing information systems curricula. The topic was picked up again Ahmed et al. (2013) who highly corroborate the earlier findings because by then software development had been converted from a solitary task to one that only can thrive if done in teams.

In another study from the field of technology, the crucial role of soft skills for engineers has been recognized as technical work is becoming more and more collaborative and interdisciplinary (Kumar and Hsiao 2007). Today many engineering education programs fail to give appropriate training in soft skills. One program at Linköping University has developed a completely new course “Professionalism for Engineers” that stretches over the first 3 years with students from across different year groups taking it together. The purpose of the program is to give engineering students training in soft skills that are of importance during the engineering education as well as during their professional career. The organization of the course is innovative in many ways, such as having mixed groups with students from year 1, 2, and 3, with each group having a teacher mentor and an examination process based on the Dialogue Seminar Method which was developed for learning from experience and through reflection. Berglund and Heintz (2014).

Conclusion

This paper discusses the soft skills potential to increase effectiveness of human interaction within and beyond organizational strengthening ethical foundations of moral respect and egalitarian reciprocity. It substantiates the relation between soft skills and organizational goals aimed to facilitate assessment of high-level managers across sectors and organizations to integrate productive processes and service chains within and beyond organizations. Highlighting the study that was performed for this paper is the proof that the hard core of soft skills and their multiplier effects have a substantial impact on professionalism, reliability, ability to cope with uncertainty, work under pressure, plan and think long-term, communicate effectively, interact with others assertively in written and verbal communication. This comes by using soft skills to augment personal talents, creativity, self-confidence, self-management, engagement with work, and willingness to deploy quality standards, and it will work best when in synch with optimal selection and application of information technology. It is hoped that this study contributes to the increasing testimony that, by soft skills deployment, organizations can optimize employees’ engagement leading to organizational agility, effectiveness, improvement in risk management and the digital dimension.

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The Public Good of Internet Usage and how Soft Skills can Bridge the Digital Divide

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Abstract

Public goods are indispensable for producing value in an economy and their usage is part of resource consumption by any business. Of the two types of public goods¹⁴: natural and social, natural public goods such as air, water, etc., has garnished the greatest attention from politicians, academics, and businesses. And monetary valuation has been applied to natural public goods. Although natural public goods are an essential area of our economy and life, with advances in technology, the social public goods such as the internet need as well to be assessed and measured since they are inherent to how we live our lives and operate our businesses, now and in the future. Some current questions on internet use are: Should it be free and regarded as a public good? How should it can be governed? Can it be monetized and if yes, how this monetization changes the public goods character of the Internet?

The purpose of this paper is to not only discuss the nature of public goods, but the social aspect of public goods, and specifically the use of the internet and its application and implementation as a public social good. In doing this we will define the societal mandate of the parties involved, which would be to create private economic gain and public welfare, and thus avoid a digital divide or division for individuals within a social society. Also, since the social good of the internet (access, knowledge and use), is inherently tied to the knowledge economy, it ultimately, must encompass the spread of soft skills – otherwise the current and future effect will not be optimal and long lasting.

Keywords: Public goods, Internet, Digital divide, Soft skills

¹⁴ The phenomenon of global public goods is only referred to in the paper as it studies the relevance of the Internet in the “macro-micro- linkage” between governments and business. Other global goods such as climate change mitigation, financial stability, security and global public health remain outside the study. But it is common core that the Internet’s nucleus of key protocols and infrastructure can be considered a global public good as it provides benefits to everyone in the world.

Introduction

Whoever uses public goods is liable for their preservation, for their maintenance and, where they are underdeveloped, for their built-up and expansion. Businesses are often reproached for using public goods for free, and they might want to demonstrate that they not only pay for them but that they contribute to the return on the capital invested in the public goods they use. With the advent of the Internet, this issue reaches a new dimension. It also connects to the new features brought about in the provision of the public good of Internet usage: The Internet, at least from how it can be accessed, is certainly some type of public good; Internet usage extends beyond borders; monetization of the Internet affects the balance between individual rights and public good – overall, though, the foremost feature is that it not only promotes innovation and efficiency but social inclusion at all levels (see, e.g., Broeders 2015). This raises the question whether the traditional foundation of public goods can aptly encompass this new phenomenon. By any means, there is a shared role that businesses, governments and individuals play in their communities and beyond. And one major theme is the empowerment approach of Internet usage.

The empowerment issue relates to the gap between those who have access to new technologies like computer-aided information and communication skills and those who do not. Ever since the development of the Internet, the gap has both widened (from a cross-border perspective; see Herman 2003) and narrowed (from the perspective of user statistics within a given society; see Deibert and R. Rohozinski 2011). The narrowing of the gap is undoubtedly due to the role of business which is getting more and more involved in the broader societal and environment context. Before examining the facets of this role, a brief presentation will be given on the way public goods have been defined and researched in academic literature and by public policy makers. This will be followed by reflections on how to value public goods in general and, more specifically, the public good of Internet usage. Apart from monetary valuation, to which there are quite a few attempts, policy makers and practitioners will find more relevance of the Internet's value for society in bridging skills and knowledge gaps. However, extending to this level is beyond what this paper can encompass.

Accessing the Public Goods Phenomenon from diverse angles

One approach to public goods that has much relevance for the topic of Internet usage comes from P. Samuelson. He made an explicit distinction between ordinary private consumption goods which can be parceled out among different individuals and collective-consumption goods which all individuals enjoy in the sense that each individual's consumption of such a good does not lead to no subtraction from any other individual's consumption of that good (Samuelson 1954). The characteristics, thus, of public goods are accessibility (non-excludability and jointness (or non-rivalry) in consumption. This definition is narrower than that of common goods where rival consumption as well occurs (like an irrigation system) and to which access may be limited (like a toll road). Buchanan (1968/1999) suggested a model embodying various degrees of "publicness", and he points out that "jointness" occurs both in consumption and in production of a public good, and it is in both that external economies, or

“externalities”¹⁵, arise: Because of the many interdependencies within an economy the behavior of one user can adversely or positively affect the consumption of a certain public good (e.g. access to water) by another user – an external effect to both of them. Internet usage definitely raises this type of concerns.

Jointness occurs both in consumption and in production of Internet usage; and this also has a social resources perspective. Social resources would be the availability of legal and of education systems, of a properly working labor market, of traffic infrastructure, of civil infrastructure in cities and other communities etc. (Bardy and Massaro 2013, pp. 501/2). This term is preferable to *social capital*, which is often viewed as a set of associations between people – social networks and associated norms that have an effect on the productivity of the community. This narrow definition that was first created by Bourdieu (1983) and has been adopted by the World Bank: “... the institutions, relationships, and norms that shape the quality and quantity of a society's social interactions” (World Bank 2013). It is merely a qualitative concept. A more encompassing view refers to the overall social and political environment that enables norms to develop and shapes social structure (see, e.g., Grootaert 1998). Social structures are also determined by what comes out from soft skills of communication, from interaction between members of a society assertively in written and verbal forms, from using personal talents, enhancing creativity, self-confidence, self-management, engagement with work, etc. The upcoming of the digital economy has increased networks substantially, and, hence, the inventory of social resources certainly needs an upgrade to include those soft skills. Also, the Internet as a public good, like with a common pasture used by all farmers in a region, without some mechanism for congestion control, this “commons” will be overgrazed, creating congestion that results in delays and outages. These aspects need to be connected to the topic of individual and business accountability, of moral standards and of monetization as well as to the role soft skills play in all those contexts.

An approach that differs from the economic view comes from the legal debate over property: Western jurists have for a long time held up that the concept of property was founded in ancient times denominating a single proprietor and his family occupying a piece of land (Ostrom and Hess 2007). However, in 1861, the English jurist H. S. Maine, drawing on what was found on the primitive Germanic village communities (the “Mark”), concluded that “it is more than likely that joint ownership, and not separate ownership, is the really archaic institution” (Maine [1861] 1963, p. 252). This had much more than academic importance, as a major political debate came off over the status of the many diverse forms of common property in Europe in the 19th century and in the early 20th century (See Hardin, 1968, “Tragedy of the Commons”).

One may argue that there is no need for the state to secure the provision of public goods or commons and that they can also be provided by communal organizations and private actors. Ostrom, in her famous book “Governing the commons: The evolution of institutions for collective action” (Ostrom 1990) has stated that public goods can be

¹⁵ The term was created by Arthur C. Pigou (“The Economics of Welfare”, London 1920), and the modern operability of the concept was first discussed by Ronald Coase („The Problem of Social Cost“. Journal of Law and Economics, 1960, pp. 1-44).

provided by private parties if stable supply, credibility and strict monitoring by all stakeholders are warranted. The book and the argumentation have aroused wide discussion. The critics reach from strict rejection of any privatization of public goods that are deemed to be “vital services” like health (e.g. Fisk 2000) and education (e.g. Noddings 2000), to demanding international frameworks for regulating private public private partnerships (e.g., Robertson and Verger 2012). New light is shed on these concerns by the discussion about how governments and private business need to collaborate in the provision of Internet usage. The most salient issues in this are accountability and inclusiveness: How can public-private collaboration improve the performance of Internet usage, and at the same time guarantee widespread public access, equity of stakeholders and reasonable quality standards (see, e.g. Steets 2004)? And is public-private collaboration overgrown by the increase in state interference with Internet infrastructure (Ziewitz and Brown (2014)? Before dealing with this, a cursory annotation shall be made on how the public goods phenomenon is reflected in statistics.

Public Goods in Public Statistics

Efforts have been made only recently to make more information on public goods available in national accounts. This is motivated by the fact that the subject now dominates policy agendas. One example is the report “Policies to Enhance Sustainable Development” of the OECD (2001), where a framework is outlined for better integration of economic, environmental and social objectives. Then there is an expansion of the UN System of National Accounts (“SNA”; United Nations et al., 1993), which is the National Accounting Matrix that includes Environmental Accounts (NAMEA). With regard to social capital/social resources, measurement instruments have started to being discussed in UN, EU and OECD policy documents (Murphy (2012). In recognition of this, various frameworks have been set up, e.g. in the U.K. (Harper and Kelly 2003) and in Germany (Dill and Gebhart 2016). If the outcome provides any quantitative results, this would certainly have to become one step for evaluating the inventory of “social resources”. With the emergence of the digital economy and the exponential growth of networks and cloud computing, the inventory of social resources needs to include the Internet and other such technological advances. Furthermore, digitization it is one of the most important aspects that fosters sustainable development, thus, a smooth performance in the net is of the essence. It could be said that this is a classic ‘problem’ of the concept of the ‘commons’. For example, when villagers have shared, unlimited access to a common grazing field, each will graze his cows without recognizing the disadvantages (or costs) imposed on the others. Without some mechanism for congestion control, the commons will be overgrazed. Likewise, as long as users have access to unlimited Internet usage, they will tend to “overgraze”, thus, creating congestion that potentially results in delays and outages. Assigning a monetary value might help here. One critical issue, though, is which methodology to choose for arriving at monetary values. The role which business is increasingly playing in the context might help here.

Public Goods and the Business Environment

There is a new role which business has been advised to take on with public goods: In April 2016, AACSB International announced a new “collective vision for the future of business education which highlights five key opportunities for business schools to add value, create market differentiation, and better serve society globally: “...business schools and businesses will act as: catalysts of innovation, co-creators of knowledge, hubs of life-long learning, leaders in leadership, and enablers of global prosperity” (AACSB 2016, p. 4). The fifth vision in particular, “acting as an enabler of global prosperity” was expanded to say: “business is now expected to be an active participant in addressing broad societal goals and social challenges” (AACSB 2016, p. 5). This vision is consistent with the changing role for businesses in our global economy and our global society, and the changing role of business and public goods.

From a business perspective, an input (any resource, and this includes public goods) needs to create value. Non-perishable resources that create value are a firm’s capital. So, public goods are a part of the capital base for value creation. Five types of capital - natural, social, human, manufactured and financial capital - were identified by, among others, the Organizational Stakeholders Group, a collaboration of large companies, banks, accountancies, certain think tanks and a few NGOs such as Forum for the Future. The five types compose the “sustainable capital from where we derive the goods and services we need to improve the quality of our lives” (Coulson et al. 2015, p. 301). The five types had also been set up for the Sigma Project of the British Standards Institution (Sigma Guidelines 2003). This concept has been amplified by the International Integrated Reporting Committee (IIRC) which added “Intellectual Capital” as the sixth type (Soyka 2013). But neither institution has set up a measurement framework that would give a monetary value to all five/six types of capital.

On monetization, there are several dimensions that can be exhibited through the example of the Internet: One is the impact of Internet usage and e-business adoption on profitability and value creation of a particular firm), one other is process (and cost) improvements in supply chains. Both types of impact can be measured directly. Then there is the subject of increased stakeholder dialogue where some effects are less direct (as they are, e.g., deploying soft skills), and there is the multifaceted effect of good working provider/customer/government relations on practical solutions in the wide area of property rights, surveillance and legal frameworks. All these topics demonstrate that the Internet, while providing benefits for all users without exclusion and granting access to all users jointly, can be deemed to be a public good. It is not measurable in terms of attributed monetary value like natural resources use like for a firm to be allowed emissions or effluents into the environment. But it definitely delivers economic benefits. So, cost-benefit analysis could help with monetization.

Public goods valuation with cost-benefit analyses?

Publicness of a good implies that the nexus between individual contribution and benefits becomes loosened. When a good is wholly private, the user “gets what he pays for”. When it is good is public, the beneficiary mostly contributes nothing towards its reproduction in exchange for the benefit. At least this is valid for what Buchanan

(1968/1999) has called “pure public goods”. However, for one, there are intermediate stages between “pure public” and “private”, and this affects the consumptive attitudes of users who are either private citizens or private enterprises. Only where the public good is fully non-excludable and non-depletable, no one can be prevented from making use of the good, and consumption by one use does not diminish the use that others can make of the good. But there are so many interdependencies within an economy that the behavior of one user can adversely or positively affect the consumption of a certain public good (e.g., public access to water) by another user – the classical case of externalities - which might per se not be socially desirable. If we take water management, benefit-cost analysis was the basis for making decisions about water resources for many years. However, since the 1950s when the techniques of conventional benefit-cost analysis were being developed and refined, there have been significant changes in the problems being dealt with. With regard to natural capital, issues like the recognition of recreational and visual amenities the, loss of biodiversity and the preservation of endangered species and unique ecological systems have been enhanced (Freeman, Herriges and Cling 2014, p. 3).

In the social sphere, we have new patterns of cooperation, transnational networks, cross-national ties, societal inclusion, inclusive organizations and inclusive business approaches, with digital inclusion being one of the primary concerns both at the business and the macro levels (for a broader discussion see, e.g., Fuchs 2007). This brings us back to the notion of the many intermediate stages between “public” and “private” in the provision of Internet services. The discussions that are held in all circles are about data ownership, Internet governance, power imbalance, hazard prevention and much more. All of this concerns the cost-benefit paradigm. Ownership, governance, power imbalance, hazards are issues that relate to all types of public goods. But digitization has changed the way to access those issues as it has also changed the economic potential of businesses and the patterns of economic competition on markets.

There are four aspects of market digitization, and each one affects how cost and benefit of Internet usage are demarcated: The collection, processing and commercial use of data by big business changes the interplay between data, market power and public authorities, above all those that watch over competition (Schepp and Wambach 2016); from that end, unhindered access to data is often blocked by the enormous transaction costs. The transaction cost conception gets new relevance (the cost for data centers, for building a sufficiently large customer base to offset huge investments in these centers and for exhaustive data analysis). On the other hand, Internet usage increases transparency between suppliers and customers, and it generates new types of task sharing that in generate new types of benefits, such as, e.g., reduced information asymmetries between consumers and suppliers. Thirdly, prices may lose their relevance when competition is at work on non-price factors like data and network accessibility. This also produces indirect network effects, i.e. the use of a good or service by a user directly or indirectly impacts the value of that product or service to other users (Budzinski and Stöhr (2018). Last, not least, with all sorts of Internet users accessing a firm (and saving the firm time and money in, e.g., order processing) “labor” (and labor cost) is no longer confined to what is expensed for the people who are on the payroll of the firm. This is one aspect the so called “clickworkers”-phenomenon, and it is the one

that relates to the topic of cost-benefit. Other perspectives that are often discussed are the sometimes questionable/destructive work and employment structures when firms are contracting out, etc., see, e.g., Sharma 2017). They are outside the scope of this study.

New types of market structure and the wider definition of transaction cost, mutual network effects and the *click-worker* issue require adjustments in valuating efforts for the public good of Internet provision. One more angle that relates to cost-benefit in digital relations is that whoever accesses the Internet contributes to this public good with costs and benefits. For this, the term “*produsage*” has been coined (Bruns 2008), How much *producers* benefit and how much they expense – that is, the specific balance between usage and *produsage* which results – remains a matter of individual choice for each participant, subject to their specific personal cost-benefit calculations (Bruns 2012). So, the methodology of valuating Internet usage will depend on which are the digitization activities of which a firm deems that they produce a cost, and which are those that it deems to produce a benefit. We may, thus, classify the Internet to be one public good that can be monetarized and can become part of the capital base for determining the sustainable value added created by a private enterprise. And there are certainly cost that can be measured, and there are benefits, that can be measured.

For the sake of completeness, here is a short summary of the other methods to value public goods:

The general concept is about the contribution of a good/a resource to human welfare relative what other assets contribute. Even though many types of resources which provide a substantial part of human welfare cannot be traded in markets, they have an “economic value”. Environmental resources (such as clean air) and ecosystem services (such as water filtration and flood prevention) are good examples of such “non-market” goods and services that can be allocated to the production of goods and services, and therefore monetary terms are needed to assign a value to those inputs. In the age of the Internet, though, “money” is not all that counts. “Monetization” of internet provision is through acquisition of data. This may turn upside down what has so far been developed in public goods valuation. Still, two methods will remain valid, at least in part, even though they only refer to environmental goods.

One technique is to determine individuals' preferences for changes in the state of the environment (“contingency valuation”); another attempt is to determine a cost for what the natural environment contributes to agricultural production (“rent capitalization”).

Contingency valuation (CV)

Contingency valuation (CV) is survey-based which makes it to some extent a relatively arbitrary method. The most frequent use is to define the monetary value of environmental goods and services for which there is no “market”. It introduces passive use into economic analysis, and the practice has met with considerable controversy. A CV survey builds scenarios that put up a range of actions which a government might choose. The participants of the survey are asked to rank their preferences concerning those actions. The choices they make are then analyzed in a way that resembles the choices which consumers make when they buy or sell goods

in real markets. Thus, the survey creates a hypothetical market and attaches an economic value to those choices.

Rent-capitalization

Arriving at values for, e.g. a forest, can be based on cash equivalents for all the services it provides, from materials such as wood and fiber to amenities like hiking and wildlife observation,¹⁹ and from the regulation of stream flow and control of erosion to the absorption of atmospheric carbon dioxide. So, there are different “rents” obtained from different uses. Rent-capitalization has found its critics, who argue that all valuation techniques fundamentally¹⁸³ simulate the existence of a market for an asset, for which an actual market does not exist. But, for quite a few¹⁶⁶ public goods, like rivers, roads and infrastructure, this is not an obstacle to assess monetary quantification. But businesses would want to know about the aggregate value of the public goods they use.

Assessing the value of Internet provision

Technically, the Internet is a network of networks which employs packet-switching communications technologies that employ multiplexing: other than circuit-switching used for voice telephony where a dedicated path is set up between the caller and the called number, the multiplex is shared by many users, and no direct connection is maintained for a particular communications session. The other distinguishing feature of Internet technology is that it is “connectionless.”⁵ This means that there is no end-to-end setup for a session; each packet is independently routed to its destination through a series of switches. The postal service is a good metaphor for the technology of the Internet: A sender puts a message into an envelope (packet), and that envelope is routed through a series of postal stations, each determining where to send the envelope on its next hop. No dedicated pipeline is opened end-to-end (Krol, 1992, pp. 20– 23). This mere technicality makes the point: The existence of an uncongested network is a public good that provides benefits for all users without exclusion; John’s use doesn’t preclude Mary’s use (MacKie-Mason and Varian 1995). The reference quoted here is from 1995, and the source asks the question how to finance this public good: “The other important task for government is to estimate the public benefit from access and usage by users who might not be willing to pay their own costs, and then to design subsidies to encourage those users.” ... “We think the growth and development of the Internet will be best served if network services are priced according to cost ... and subsidies should be distributed so that users can pay those charges” (MacKie-Mason and Varian 1995, p. 32). However, more than twenty year later, charging for network services is unimaginable. Even though, they are not free - they are paid for by data. This mode of monetizing the Internet raises several concerns: Who should regulate Internet content, and how? What are the responsibilities of an institution/a business toward one of its telecommuters in another country? Should there be a property regime of the digital economy and how would it have to be designed? Can the international character of the Internet be reconciled with the laws of individual nations and the moral standards of individual communities?

It must be noted that right now we are seeing very specific moves in the U.S. to monetize the internet based on providers’ ability to pay. Historically all individuals have had equal

access to the internet, which is called virtual equity or equality (“net neutrality”) with Internet service providers (ISPs) giving all consumers uniform access and not favoring one group over the other; e.g., business over non-business consumers. On Dec. 14, 2017, the Federal Communication Commission (FCC) under President Donald Trump voted to allow large telecommunications companies more access, bandwidth, etc. than smaller providers and consumers. There are numerous groups that are lobbying in Congress to maintain net neutrality. Only time will tell which direction this will go.

Each of the answers to these questions would also relate to the issue of connecting business performance to Internet usage. There are several dimensions: One is the impact of ICT usage and e-business adoption on profitability and value creation of a particular firm (see, e.g., Wu, Mahajan and Balasubramanian 2003, Levenburg 2005), one other is process (and cost) improvements in supply chains (see, e.g., McCormack and Johnson 2016). Both types of impact can be measured directly. Then there is the subject of increased stakeholder dialogue where some effects are less direct and of which skeptics may argue that the internet is rather used by a firm to “manage” the stakeholder relation (Unerman and Bennett 2004). And, last but not least, there is the multifaceted effect of good working provider/customer/government relations on practical solutions in the wide area of property rights, surveillance and legal frameworks. All these topics demonstrate that the Internet, while providing benefits for all users without exclusion and granting access to all users jointly, cannot be deemed to be a “pure” public good. It is not measurable in terms of an attributed monetary value like the natural resources and the other social resources in the equations presented above. But it definitely delivers economic benefits, both tangible and intangible. So, we are back to where we were: Applying cost-benefit analysis seems to be the best avenue.

Conclusion

For a firm to create value for all stakeholders, it will make use of “outside” capital tied up in economic, ecological and social resources. The Internet is part of them, and while it is reshaping the patterns of public goods provision, all who participate in digital networks need to earn the cost of Internet usage like all other public goods usage. There is a distinct macro-micro link in this, and with the ever-increasing Internet usage a societal consensus has developed that sees private individuals, businesses and governments in one boat: For one, businesses are the agents not just of their shareholders but of a wider group of stakeholders. Businesses recognize their greater role in society and they also acknowledge that they have wider responsibilities go beyond their immediate shareholders towards a greater stakeholder model. The communal use of the Internet will force corporations to conduct business in a manner that provides social value (like ecological value) to a broad range of stakeholders, while achieving greater long-term performance.

The use of the Internet is creating what can be called an inclusive society, first in those parts of the world where the number of users proliferates. Then, from there a “contagion” is very likely to happen to the other parts. The role of businesses is to act as inclusive organizations: Inclusive organizations are open systems of opportunity in which all stakeholders have access to information, resources, and the capacity to fully

contribute to their functioning. Inclusive organizations not only recognize the value of their internal resources, but also the external that have contributed to their success. In understanding this, business organizations, both public and private must appreciate the role that others have played in gaining success. User skills can only spread throughout the groups that participate in the Internet with this interdependence. A private Internet user who connects to a business firm provides some sort of support to the firm, be it through establishing a new business relation or just by sharing data (willingly or not; but, in the end, anyone user is a priori accepting that data will be shared). This insight will potentially assist in bridging a rift that could develop in a society that differentiates between those who seem to only contribute and those who benefit. Another aspect is collaboration in governance issues. Businesses representatives, civil society groups, governments, standard-setters and regulators need to form a coalition for building, adapting and protecting the public core of the Internet through agile infrastructure and protocols. Those who do not partake will risk that they are left standing by. Any attempt to restrain and to create divisions within this public good must be prevented.

Adding to this need by policy and business leaders to establish open and equal access of the internet to the public is the future directions of the worlds' economies towards a focus on knowledge. With Artificial Intelligence (AI), robotics, etc., having knowledge and the ability to continuous acquire new knowledge will be essential for one's survival. Where in the past one acquired knowledge incrementally and as needed based on periodic changes in industry and science, the pace of technology has accelerated the need for acquisition exponentially with no end in sight. This knowledge acquisition applies to both old and young workers. Individuals without the current knowledge and ability to quickly and speedily acquire new knowledge will be left behind, thus creating a digital divide among the population. As nations struggle with income and wealth inequities, these inequities will grow dramatically greater without equal access to acquire and learn new knowledge.

On a more optimistic end, the rise of collaborative arrangements between public and private institutions is creating novel ways for enhancing the provision of public goods. The pertinent arrangements will only work if both private and governmental organizations deploy willingness and ability to participate in such arrangements and if they include all constituencies of the "public domain". They altogether have a societal mandate to create private economic gain and public welfare.

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What the West can learn from Central & Eastern Europe: Soft Skills Spillovers and Reverse Knowledge Transfer

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Abstract

The transition economies from the former Soviet sphere, when opening up to the West, required the transfer of knowledge from free market economies in the developed countries. In time, many of these former Soviet countries or satellite countries not only learned the practices of Western economies, but also the opportunities that aligning with the West could bring them. But, as knowledge does not go in one direction but flows in multiple directions, there have been quite a few occasions where reverse transfer of knowledge took place. The paper presents case reports on a Western based MNC that has a strong presence in the Visegrád Four (V4), a cultural and political alliance of the Czech Republic, Hungary, Poland, and the Slovak Republic. It exhibits various forms of knowledge transfer from the subsidiaries back to the parent organization and it also demonstrates how the pattern that underlies the cases fits into the theoretical concepts of knowledge management.

Keywords: Soft Skills Spillover, Reverse Knowledge Transfer, Central & Eastern Europe

Introduction

With the final fall of the former Soviet Union on Christmas day in 1991, new economies opened throughout the world, but most particularly for countries in Central and Eastern Europe (CEE). Upon the opening of these countries, many multi-national corporations (MNCs) saw opportunities in these new economies and very quickly moved or prepared to move new operations there. However, the move from a planned economy to a market-based economy for many of these countries, as well as the MNCs operating there had not always been easy – 40 to 70 years of Soviet dominance, both economically and culturally did not break down easily. In the transition economies from the former Soviet sphere, former state-owned enterprises became privatized and learned about the practices of a market economy. They communicated this vision and those practices to the larger communities which also took advantage of the *opportunities that aligning with the West could bring them*. This has been particularly the case with the Visegrád Four (V4; the Czech Republic, Hungary, Poland, and the Slovak Republic). One feature these countries share is that they had a substantial industrial base, and even though these industries were only scarcely diversified and were not able to sustain themselves when confronted with the combined loss of markets and the opening to the international law of value (see, e.g., Smith, A. 1996), this characteristic provided one prerequisite of knowledge transfer, which is absorption capacity (Szanyi, M. 2017). With

absorption capacity existing on both ends, i.e., in the provider and the receiver of knowledge, their roles can easily switch. The cases reported herein are good examples of this. However, there are more preconditions. One other is identification and assessment of capabilities and resources, a concept of the organizational behavior literature (for an overview to this regard see Gold, Malhotra and Segars 2001). Our paper will first examine the conditions and requirements in knowledge management / transfer and then set forth our three cases.

Knowledge transfer: A multi-faceted issue

Knowledge transfer is the sharing or distribution of knowledge from one (part of) an organization to another, with the hope that this transfer of knowledge will provide the desired results and that the new knowledge becomes embedded within the organization's fabric (Lucas, 2006). In an international context, the academic literature, historically, has focused on knowledge transfers from parent companies to subsidiaries, and generally very little on reverse knowledge transfer from the subsidiaries to the parent organization (Dunning, 2001; Rugman, 2006; and Vahlne & Johanson, 2014). But in our highly competitive global market, competitive advantage depends on the transfer of knowledge at all levels, and in all directions, in the organization. In addition, it is imperative that this knowledge has the potential spill-over effect of increasing the soft skills of the companies' workforce, which subsequently will increase the competitive advantage of the company. This applies to a company's internationalization efforts (Dobosz, 2006) as well as to the efforts of a transition economy to gain a level at par with developed economies: The speed of converting to a market system depends on how a transition economy manages to educate the workforce and to build entrepreneurial spirit (Maksimov, Wang and Luo 2017). While the V4 are members of the EU and are not transition economies any more, and many multinational corporations have moved their plants and operations to these nations, the knowledge base of these countries, for some time, had still be considered less than the advanced economies of Western Europe and the U.S. (Petrakos 2009). However, not only is the knowledge base building up, knowledge from these countries is also – in a reverse way – transferred up one level, i.e. to their counterparts from Western Europe and the U.S. We might include Japan and South Korea as well, since, e.g., Kia Motors and Samsung are also present in the V4.

Reverse knowledge transfer has mainly been studied between foreign subsidiaries and their (Western) headquarters or other affiliated companies. The literature on such bottom-up transfer is still limited (Ambos, Ambos, and Schlegelmilch, 2006; Criscuolo, 2009; Hakanson & Nobel, 2001; J. Li, Strange, Ning, & Sutherland, 2016), in spite of its growing importance to the knowledge generation of multinational corporations and its contribution to global competitive advantage (Frost & Zhou, 2005; Makela, Bjorkman, & Ehrnrooth, 2009; Tseng, 2015). One other large stimulus for business-knowledge-building in transition economies are supplier-buyer-relations since the partners in this type of network not only share common interest but also common tools and business processes. And reverse transfer of knowledge certainly happens here, too. We will examine both facets, but, first, a brief account of the characteristics will be given that embrace both areas of knowledge transfer.

The organizational-learning process

For transfers of knowledge, theory presumes that the essential prerequisites are absorptive capacity, transferability and possibility of integration (Cohen and Levinthal, 1990). While transferability is a feature related to the type of knowledge that is exchanged, absorptive capacity and integration are connected to people and organizations. Absorptive capacity is a measure of prior knowledge, since it is just impossible to tap into the knowledge required in a specific situation without a minimal stock of prior knowledge (Cohen and Levinthal 1990; Zahra and George 2002). Absorption is not cost-free: its pre-condition is to build a capacity to learn and to imitate. From there, knowledge transfer may be viewed as a type of network learning that develops along several stages: “Identification”, “experimentation”, “reflection”, “discrimination”, “unlearning” and “communicating” (Lyles and Dhanaraj 2004). This combines the process models of learning (e.g., Argyris and Schon, 1974; Nonaka, 1994) with the structural models of learning (Badaracco, 1991), and while expounding those models lies beyond the scope of this paper, the authors wish to demonstrate how they are reflected in practice. For that, the six steps are exhibited through the example of an order-processing relation which the parties to the process wish to change. This example comes close to the three cases we present below.

- *Identification:* The partners will easily determine that adding new features to their systems of e.g. replenishment planning, of placing orders and of goods receiving would produce improvements.
- *Experimentation:* The upstream partner as well as the downstream partners in the relation will mostly start with ‘guided experiments’, allowing a small team of the knowledge provider to instruct some of their employees on how to introduce additional procedures or modified practices. In order to avoid failure through omission or understating the complexities, unsatisfactory outcomes in the experiment will be meticulously screened by all parties, and the employees will feel that the benefits of the experimentation exceeds the cost and time they had to devote to the issue.
- *Reflection:* Past behavior and performance will be unambiguously introspected in the light of the new methods that are being tested. Systematic assessments will be taken of how the new methods would improve the issuance of e.g. purchase orders, commissioning and order picking, and this will open a series of dialogues with all parties to be involved.
- *Discrimination:* From what was learned on the base of experimentation and reflection, directions to go will be identified: E.g., a collaborative replenishment planning alternative may be preferred by one of the partners while another may choose vendor management inventory for a specific range of products.
- *Unlearning:* In order to achieve the expected improvements fast and smoothly, the partners in the network will reframe their past programs to fit with the changing conditions, and the employees will be motivated to “discard the old knowledge”, thus making way for the new responses to the issues which had not had optimal

solutions in the past. The employees will regard organizational effort as a distinct reward for their input into the projects.

- *Communicating:* The executives of the partnering organizations will be eager to translate the outcome of the projects within their domains and to develop a shared understanding of the basic concepts. It must become common understanding that sharing process-knowledge does not mean that one party will receive any undue favors or that competition will be edged out. The message will be that process improvements increase the competitive advantage for all members of the projects.

With this background of how theory and practice concur in the field of knowledge transfer we will now proceed to review the two major settings which are of interest to our study.

Knowledge Transfer between Members of a Corporate Network

In a recent literature review, Secches-Kogut and de Mello (2017) define reverse knowledge transfer as a process through which knowledge is transferred from a source that is affiliated (subsidiary) to the recipient (headquarters), and the recipient receives, assimilates and applies their knowledge in order to obtain a competitive advantage. As said above, absorption capacity, the willingness to integrate knew knowledge received and the quality of the knowledge in question play an important role. Knowledge, of which the characteristics may be complexity and tacitness, flows from the source unit to the target unit where the transmission process per se embraces formal and informal mechanisms, as summarized in Figure 1 below.

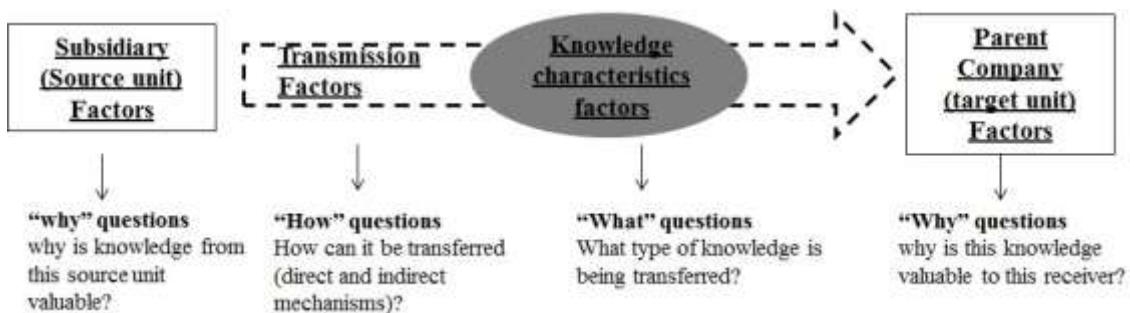


Figure 1. Internal Knowledge Transferring Process within a Multinational Corporation
Source: Gupta and Govindarajan 2000.

The figure cannot capture all ingredients to the process. One important antecedent pertains to the circumstances under which the knowledge was created in the subsidiary. If the MNC entered the country through an acquisition, it is more likely that it has a stock of knowledge that is ready to be transferred to headquarters (Gupta and Govindarajan 2000; Najafi-Tavani, Axèle and Sinkovics, 2012); sometimes this even is the very reason for the acquisition. On the other hand, an acquired company has a specific culture and set of values and routines, which differs from that of the acquirer and makes the subsequent transfer of knowledge more challenging. On the other hand, a subsidiary that was created from greenfield investment will, by nature, depend more on the parent company’s knowledge base. If it has a stock of knowledge to transfer to the parent company, this knowledge transfer process will be easier (Najafi-Tavani, Axèle and Sinkovics 2012). But whichever the entry mode has been, the process will be harmonized

as it most likely has to follow corporate guidelines.

Knowledge Transfer and Buyer-Supplier Relationships

The most widely practiced knowledge transfers are to be found in supplier-buyer relationships. Here, operational improvement is one important goal of mirroring customer development with supplier development, but there is much more to buyer-supplier relationship building. From a stage, where operational integration mainly dominates the relationship, it can evolve towards a partnership of co-development and early involvement in technology and service strategies. The suppliers may slowly become a strategic source in the process of designing new fields of business. With these changes, the knowledge bases entailed will also change, and with an even closer relationship there will be more interdependence, up to a degree that the risks connected to that interdependence and the pertinent switching cost might be felt to be too high. It has been shown that companies feel less exposed to such risks if the partnering firm is not a large enterprise (Caniëls et al. 2010).

Operationally, the linkages between a retailer, its suppliers (“upstream”) and its customers (“downstream”) are formed by controlling the logistics. When operating as an integrator, a retailer assumes the task of managing all the logistics in an explicit product range (e.g. office materials) for its customer: the customer specifies its needs, the retailer finds the sources and provides the qualities and quantities at the delivery dates convened upon. Using the information given by its customer, the retailer may also help the customer in defining the replenishment cycles, in replacing outdated specifications, in managing inventory, etc. – and when transferring the data into purchase orders or contracts to the ultimate suppliers, the retailer might also advise them on how to deliver “to measure”. The benefits for the retailer’s customer go well beyond customized service: Generally, total cost of ownership for all items procured will decrease from the outset, and it will continue to decrease over time. So, the original investment on the part of the customer (adapting order issuance and receiving systems, training the personnel, building adequate storage etc.) will pay off rapidly. The same logic applies for the retailer’s suppliers: They will have to invest in updating their order processing, warehousing, picking and commissioning and delivery systems, but there will be a return on this investment shortly through increased business.

For both supplier and buyer, one foremost field of knowledge exchange is marketing. Our three cases that will be presented in the next section are from the retail business, where sharing of marketing knowledge is beneficial to both a large retailer which buys from small local vendors and to these vendors themselves. In general, retailing is perceived as a rather traditional business sector, concerned mostly with making good deals, putting high pressure on suppliers and selling at competitive prices. However, over the last few years, the world of retailing has greatly increased in complexity and sophistication. Retailing has been the industry that has principally fostered breakthroughs in supply chain management and logistics, and it leads other sectors in customer data capturing, data warehousing and data analysis. Advanced econometrics and optimization methods in domains like pricing and integrated marketing communications are developed and employed not only by big retailers like Walmart,

Tesco, Carrefour and Metro (business-to-consumers sector, “B2C”), but also by smaller companies, especially in the business-to-business sector (“B2B”). These methods constitute a knowledge base for which retailing professionals must receive training and expertise insight continually, many of which is provided by the industry itself. Up on that, the business partners collaborating in retail supply chains need to exchange knowledge on innovative processes (and products), and this exchange is an essential part of customer- and supplier-development activities.

In B2C, customer experience is carefully managed to make customers “have fun” and “co-create” (Prahalad and Ramaswamy, 2004), and this is achieved through helpful staff, unique product selection, imparting a sense of discovery, trials before the purchase etc. Translating the pattern into the B2B sector, the participation of customer and vendor in a shared enterprise that involves the abilities of both, will also develop that “sense of discovery”: The companies’ contact persons will find that life gets easier when they collaboratively apply methods which enhance improved account information, faster placement of orders etc. and thus diminish the cost of transactions. The more they get to know about each other’s needs and the more they continue to adapt the service or the service requirements to each other’s evolving specifications, the closer they get to each other. This “learning relationship” becomes smarter with every interaction based on a positive experience being built up.

Similarly, both in B2C as well as in B2B, the service provided should supply the “five sources of convenience” (Grewal et al., 2006): Decision convenience, by bringing appropriate information to the customers; access convenience, by assisting customers to find the merchandise they need; transaction convenience by facilitating checkout and returns; benefits convenience by helping customers to understand the advantages of the products and services they buy, and finally post-benefit convenience by empowering the customer to rectify post-purchase problems. In B2C this can be ensured mostly by knowledgeable personnel and advanced store organization, B2B retailers must identify and interact with the individual decision makers and influencers within their customers’ organizations, they must adopt account development strategies in order to service as many divisions of a customer as possible, they must customize transactions procedures, and, much more than is the case in consumer marketing, they must teach their customers how to make the most productive use of their products and services. In a nutshell, they must “help clients to manage themselves” (Peppers and Rogers, 2001).

A successful retailer will mirror customer development with supplier development. The knowledge base applied to interacting with customers and to customizing the services and products can also be used to building an optimal supplier-relation. Both ways are often called “vertical knowledge spillovers”: The demands and feedbacks from a customer or from a supplier may push and pull the upgrading of a firm’s knowledge base and lead to process innovations. Supplier development is primarily focused on transaction improvement, from order processing to warehousing and delivery processes, on inventory management, quality control, etc. – all these aiming at properly and comprehensively matching supply with demand.

When all the knowledge exchange, collaborative development and communally managed transfer processes take place in an environment where large MNCs connect to small and medium businesses in emerging markets or in transitional economies, there

will certainly be some cultural obstacles. Cultural barriers have been recognized as a central challenge in knowledge transfer (Hutchings and Michailova, 2004; De Long and Fahey, 2000). In cross-cultural settings we often find a strong emotional group affiliation among individuals and a high level of suspicion (Hutchings and Michailova, 2004). This behavior has been analyzed in the literature, and it was found that its determinants could include: fear, lack of understanding, unwillingness to value the work of others (Webb, 2011). At the same time, apprehension about failures has been recognized as an important obstacle for knowledge sharing among organizational members. This fear could be even bigger among networks of companies in developing countries (Hutchings and Michailova, 2004).

Moreover, the “in-group” effect could affect the effectiveness among knowledge sharing processes – the opposite, positive feature would be the “willingness to share” effect (Earley, 1993). It has been also suggested that individual group membership is culturally variable and that individualist and collectivist cultures play a central role in recognizing the value of being part of a group (Earley, 1993).

At the same time according to Dixon (Dixon, 2002, p. 39), “the better that a group of people knows each other, the more that people in the group will call on each other’s knowledge”. Thus, trust could be considered a key element in knowledge sharing processes. Literature (e.g. Chow et al., 2000) found several differences among Western and Asian managers attitude in this aspect for promoting the knowledge sharing process. Indeed, literature recognizes an important role of interpersonal relationships for leading a network in a transition economy (Peng, 2000). According to Hutchings (Hutchings and Michailova, 2004), this approach could be referred to the existence of an exchange mechanism especially in former communist countries. During communism people had to fight with a theoretical ideology of equality and a substantial reality of differentiation in the distribution system of resources. In this condition, a personal exchange mechanism based on close friendship and trust was developed becoming an inextricable everyday life part.

These aspects pinpoint the role of knowledge spreading in economies that were, like the V4, communist countries. It took quite some time to build a general awareness of the advantages a market-driven economy provides to consumers, businesses, to employees and to the job-market. By using entrepreneurial personal relationships, the action to “spread the word” – and spread the knowledge - seems to have been more effective. For instance, in Eastern Europe, the small-scale entrepreneurial sector, having emerged as the most dynamic segment of the economy (Fingleton et al., 2003) not only has created jobs and induces growth, it also has a prominent educational function. One issue which has often been named to be the main reason why the process towards a market economy started earlier in Hungary than anywhere else in Central Eastern Europe, is the high per-capita ratio of incorporated firms: As early as in 1992, there were eight incorporated firms for every thousand people in Hungary as compared with Poland, where the ratio was three for every thousand people. The ratio in Czechoslovakia was even lower (Boter, 1994).

In the early stages of conversion after the fall of communism, many SMEs in those transition economies were created from the break-up of large, state-owned enterprises and mass privatization, while others commenced as start-ups. From these early years of

transition, SME entrepreneurs in Eastern Europe have transmitted their vision, commitment and knowledge to their stakeholders such as customers, suppliers and employees. Their willingness to take calculated risks would drive them to do everything possible to influence the odds, and that includes building a team of people with complementary skills. They could also build on what may be regarded an advantage which the former communist countries had over other transition economies. This advantage was that engineering and other technical professions had received sound education and expert training (Behrmann and Rondinelli, 2000). It is these firms who are establishing same-level relations to international firms, and it is them from where the MNCs are either recruiting professionals or acquiring the personnel through buy-outs or purchase of local businesses. Thus, it becomes understandable why knowledge transfer from these economies not only becomes feasible but is increasing (Pérez-Nordtvedt, Mukherjee and Kedia 2015). Our case reports serve to solidify this tendency.

Case Reports – Reverse Transfer of Marketing Knowledge

Tesco, Ltd., the British multinational groceries and general merchandise retailer is the third-largest retailer in the world measured by gross revenues and has subsidiaries in 11 nations. Since the mid 1990s, Tesco has had a presence in the V4, with approximately 240 stores in Czech Republic, 200 stores in Hungary, 400 stores in Poland, and 180 stores in the Slovak Republic. The case studies centers around Tesco Slovakia and Tesco's Regional marketing department. for Tesco's which is based in Prague for Central Europe and the V4 nations.

Tesco Slovakia or Tesco SK is the largest retail chain in Slovakia. Tesco SK operates two central warehouses which supplies the products for its 180 stores. The large number of its retail outlets are large supermarkets which provide a diverse range of products from food to clothing, to household items. Tesco SK also operates small food outlets called Tesco Express which provides primarily food items. However, whether one is shopping at the large supermarkets (called My Tesco) or the smaller, more convenient Tesco Express, Tesco SK maintains a consistency in both price and quality. Similar to other countries, Tesco SK as a large conglomerate is able to provide larger variety and reduced pricing compared to locally based stores with similar products.

Tesco's in the V4 nations has a centralized marketing department which is located in Prague, Czech Republic. Although each of the V4 nations has a marketing management for their respective countries, these country managers report to the marketing department in Prague. The primary responsibilities for the centralized marketing director in Prague is: communication; research; and pricing; innovations; and the deployment of digital media. In addition, the marketing director in Prague coordinates all strategy and initiatives for the V4 nations.

Case 1: Local Suppliers

Recently, Tesco SK has initiated a program that brings products from local manufacturers onto its shelves. The commercial team initially established a pilot program with local producers of: fruit and vegetable, meat and provision, fish, dairy and bakery products. This program allowed local suppliers to deliver their products directly to Tesco stores in their region (prior to this all products were distributed from one of

the central warehouses located in the country). A public relation campaign (media and leaflets) supported the sale of local products from Slovakia.

The local products were placed in the stores alongside of national and international know brands and products. The products were identified as locally sourced.

The regional producers welcomed the opportunity to deliver their products to Tesco stores. The project not only presented a positive image of Tesco, but increased the awareness of social responsibility of the chain and its relationship with the local communities. Additionally, this initiative to use local suppliers was greatly supported by government bodies from the Ministry of Agriculture.

Following the initial success of the pilot project in Tesco SK, the details of the operation was shared with the market director in the Czech Republic. As the result of the Slovak project, the other Visegrad 4 nations of Hungary and Poland replicated the Tesco SK model (adapting it to their local context) and instituted it in their stores in their respective countries.

Case 2: Point of Sales Promo Pricing

In early 2017, the marketing Director in Prague decided to consolidate all Point of Sales (POS) materials used in Tesco stores in all 4 countries. The key objective was to create a similar look and feel with material across all the stores. The project was led by the Tesco Czech team.

In pursuit of this, the Czech team developed a general design for all POS material which covered varied areas in the stores: aisles by an entrance, action alley, aisles for regular product placements, counters bistro, bakery, products, etc. Although the POS materials were eye catching and easily accessible for customers, Tesco SK identified an issue a few weeks after the launch of the project. Some of the images in the POS materials were communicating solely the promotion mechanics; e.g., “promo” or “clearance”, while the particular prices were written on the small size shelf labels. Since price is a key decision factor for customers the pricing material needed to be changed. The Slovak marketing team initiated a local adaptation of regional POS materials to inform the customers about the prices of the products. In addition, each POS format was adjusted so that the stores could print the prices directly on POS or on an additional piece of paper that is placed next to the respective POS. Therefore, customers could see the old price, promo price, and the discount in %, unit price. This modification from Tesco SK was subsequently approved by headquarters and all three countries within the Region applied the original Slovak templates of the POS materials only with slight adjustments according to their local specifics.

Case 3: Customer Feedback

Historically, Tesco assessed customer satisfaction at its stores via face-to-face interviews. Briefly, interviewers visited each store three times a month and interviewed customers after they had checked-out and paid for their goods. Procedurally, the interviewers would approach customers after they had paid for their goods, and asked them if they would respond to a few questions about their customer experience. Although face-to-face interviews is regarded as a positive method to illicit customer

feedback, the process was generally seen as not only as labor intensive, but very expensive to implement and maintain. In addition, store managers felt that there was a risk of bias due to manner in which the interviewers asked questions (tone, inflection, etc.) which could ultimately skew the results. Therefore, it was felt that a new method to evaluate and assess customer satisfaction was needed.

In pursuit of designing a new method for customer feedback, a select team from Tesco SK initiated a contract with a research agency to develop an online questionnaire that would ultimately be accessible from the Tesco website. Generally, the questionnaire accessed the same topics as the face-to-face interviewers, but it also allowed customers to send individual messages or videos to Tesco regarding their customer experience. In order to incentivize customers to complete the survey, customers could earn extra Clubcard points (bonus shopping points) and have a chance to win 150€ for their participation. Although the participation rate of 50 respondents per store with the online survey was slightly below the rate achieved by personal interviews, it was felt that it was sufficient to assess store performance. In addition, this method was also more flexible, and it allowed the feedback to be communicated to the respective stores much faster than the previous method. After initial testing and tweaking of the online questionnaire, the model was shared with the other countries in the Region. The Czech Republic, Poland, and Hungary instituted a large marketing campaign to promote the use of this new method and similar to Tesco SK, they gave extra Clubcard points and prizes to motivate shoppers to complete the online survey form.

Conclusion

Our three reverse transfer cases show how unique marketing activities in Tesco Slovakia's subsidiaries can be developed across the region. Specifically, the marketing ideas and practices from Tesco SK drove innovated changes in their operations. Subsequently, these changes were communicated to the Regional Marketing Director in Prague, who then shared them with the other subsidiaries in their region. In addition to the direct benefits that were gained as a result of the implementation of these projects, Tesco witnessed the inferred benefits of the promotion of soft skills transfer as a result of the need to communicate and share ideas and practices across stores in and outside their region.

The knowledge gained in these cases connects to the theoretical considerations on knowledge management found in academic literature – that being that knowledge can be shared and transferred throughout the organization. In our cases we saw that practices such as integrating the local supplier base, reconstructing promo mechanisms, and implementing new customer feedback systems are all activities and practices that are part of the social, the structural and the technical infrastructures of interrelation. And even though they differ from location to location, the basic concepts, skills and practices are transferable upwards, downwards, and across the whole organization.

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Supply Chain Management

ERP on the edge of knowledge retention: how to prevent knowledge loss in customized manufacturing

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Abstract:

Customized manufacturing entails a personalization demand, which turns manufacturing into a complex task difficult to solve automatically. Customized manufacturing requires completely new technological solutions and long and careful prototype development and testing. The technology-based approach relies on collection and preservation of information and factual data and ERP is the most common solution to realize that approach (Blankenship & Brueck, 2008). However, it still fails to respond to the customized needs even though ERPs provide plenty of innovative solutions for prognosis, trending, etc.

The study shows, that production of customized furniture takes on average 60 percent longer than production of standardized furniture. The study also reveals that the costs of custom-made furniture production (cost estimation) are usually predictable, taking into account furniture size (11.6%), production time (25.2%), design coincidences (8.8%), used materials (26.1%) marketing (9.0%) and know-how (19.3%).

The goal of this paper is to investigate the ways of knowledge preservation recognizing the ERP role and defining the stimulus to preserve knowledge for future decisions in cost estimation in customized production.

Keywords: knowledge loss, knowledge preservation, knowledge retention, knowledge management, customized manufacturing.

1 Introduction

Customized manufacturing entails a personalization demand, which turns manufacturing into a complex task difficult to solve automatically. Customized manufacturing requires completely new technological solutions and long and careful prototype development and testing. The unique requirements increase production costs, extend manufacturing time and entail frequent errors in the product quality (Lau, W. K. Elaine 2008). Customized manufacturing encounters cost estimation at the initial stage already because the accrued organizational knowledge about a new production item does not necessarily include specifications of the new order. Consequently, cost estimation at the initiation stage increases production complexity, and stimulates a greater demand for organizational knowledge management and retention in particular. In the global competitive market, the pricing stage has become one of the most

important stages in the process of manufacturing and the knowledge accrued during the stage has become critical for the manufacturer. Pricing is the initial stage of the five stages of customized manufacturing (marketing, price quotation, designing, delivering, assembling) (Martin et al. 2017). The importance of pricing has long been neglected deeming it entirely a matter of business client negotiation or a quotation based on fundamental knowledge about the cost. Such practice met requirements for mass production and the stage of customized manufacturing where the client was willing to pay extra for their individual needs (Lukic, Dejan et al. 2016). In such cases, price calculation for standard production also affected the approach to applied knowledge retention strategies where corporate knowledge management focused on manufacturing data and in particular on the substantial nature in their collection, storage and revision (WHO 2005).

As the industry is shifting towards customized manufacturing, the stage of pricing requires substantial efforts (time, precision, knowledge on manufacturing processes (supply cost, design solutions and diversity, manufacturing technologies, untold client expectations) and an adequate reaction. Thus, retention issues start forming already during this stage, which ensures the feedback loop of the manufacturing cycle. Looping causes unintentional complexity. A prompt and natural instrument to deal with complexity of customized manufacturing is the use of various complexity management strategies: ERP implementation, marketing and customer relationship, search for similar patterns (analogous recognition), flattening of organizational structures (Mikulskiene and Vedluga, 2019). Companies often tend to expect that loyal high qualification employees or an ideal ERP automatically grant knowledge retention. However, in most cases, companies fail to experience the expected effect, and the customized manufacturing suffers extensive time expenditure and inevitable mistakes in the phase of cost estimation. Therefore, it has become vitally important for businesses to clearly define their retention strategies, that is to deal with such questions as search, identification and storage of important knowledge to preserve and codify tacit knowledge so as to be able to use it for pricing or even forecasting.

The goal of this paper is to investigate the process of price estimation defining the moment of emergency of critical knowledge, the need for knowledge preservation and the need to recognize the boundaries of ERP development in knowledge retention. Also, it makes sense to define the stimulus to preserve knowledge for future decisions on cost estimation in customized production.

2 Background

2.1 Knowledge retention and preservation

One of the major challenges for organizations is to manage knowledge assets for the purpose of gaining competitive advantage in every sector of industry including customized manufacturing (Fong and Choi, 2009, Arif *et al.*, 2012). Even though in general organizations acknowledge the benefits of knowledge management for their business operations (Chatzoudes *et al.*, 2015), to select particular knowledge management strategy timely and response to changing environment (increasing the

ratio of individual production) adequately is a challenging task. Seeking productively use knowledge, the company has first to resolve the issue of knowledge retention. Knowledge retention has been defined as “maintaining, not losing, the knowledge that exists in the minds of people (tacit, not easily documented) and knowing (experiential action manifesting in behaviour) that it is vital to the organization’s overall functioning” (Martins *et al.*, 2012). Meanwhile, the impact of knowledge loss is a largely unexplored area of strategic management ([Massingham](#), 2008). An actual effect of knowledge loss is often insufficiently perceived and almost never documented. While there has been some research into how knowledge loss affects the organization (Shah, 2000; Droege and Hoobler, 2003), these studies are limited to single impact areas, e.g. social relationships ([Massingham](#), 2008). The effect of knowledge loss on customized manufacturing is even more significant and therefore it has become essential to combine strategic planning with knowledge management including knowledge retention as well.

Three sources are easily identified where knowledge could be loss. It is loss of qualified personnel, loss of repositories (data and information storage loss) and failure to capture critical knowledge. The capture of **critical knowledge** is the most sensitive for customized manufacturing. Focusing on critical knowledge is crucial in identification of spheres that have to be paid most attention. According to Jose Carlos Tenorio Favero (2016), critical knowledge is essential in development of business strategies since it often comprises valuable information, such as data on product development and market segmentation, output summaries and other data necessary for the company's further development. Identification of critical knowledge facilitates further development of strategies and strategic planning. In such cases, it is sensible to supplement development of efficient strategic instruments with a concurrent development of a knowledge based corporate culture. The biggest risk is associated with the loss of critical knowledge comparable in its effect to the loss of repositories or qualified personnel. Generally speaking, loss of qualified employees makes a significant part of corporate expenditure. Specifically, expenses on employee replacement range from 93% to 200% of the annual employee salary depending on the nature of the job and responsibilities (Razanarivonjy M. A. 2015). Companies working in a competitive business environment may not ignore effects of such expenses on the company's efficiency, in particular companies working in customized manufacturing providing very specific services. The turnover of critical knowledge is likely to impede company's development and increase the risk to lose it competitive advantage resulting rather in negative than positive outcomes (Razanarivonjy M. A. 2015). A less frequent factor causing an even more significant damage is the loss of repositories. In such a case, a company may face tremendous losses or may even be forced to terminate its performance. Data lost because of a serious breakdown or a natural disaster is almost irrecoverable, although data stored in repositories is extremely safe since its backup copies are stored in several locations and several devices (Dix, 2010).

All free sources of knowledge loss could be tackled by knowledge retention measures. From that perspective, knowledge retention can be implemented by maintaining three different approaches: technology-based, interaction-based (capturing the process and practices) and culture-based (best practices with interactions of professionals) (Levallet et al.2018).

Technology based retention approach - ERP in connection with knowledge management. Probst et al. (2006) divided the knowledge preservation process into three stages: selection, storage, and actualization, which will be used as a frame in further research in order to identify suitable information and communication technology (ICT) tools for knowledge preservation. The technology-based approach relies on collection and preservation of information and factual data, and ERP is the most common solution to realize that approach (Blankenship and Brueck, 2008). So far, the knowledge management framework partially supported by ERP systems provides many advantages for corporate knowledge management, mainly for storing, sharing and structuring of data. An ERP system allows an organization to have a convergent and integrated view of the organizational information by means of centralized databases and integrated business processes across the lines of different divisions and departments (Baskerville *et al.*, 2000). It could be said that as a result of technology-based retention implementation, the organizational information and knowledge converges across different divisions and departments on an organization-wide scope (Usman and Ahmad, 2012). Eventually, the overlap between the knowledge of different divisions increases and the knowledge on the organizational scale follows a converging pattern. However, on the organizational level, this convergence tends to turn into divergence as we move down to the individual level. The simultaneous implementation of corporate resource planning and knowledge management systems in organizations implies some sort of contradiction by its nature. Corporate systems are meant to increase the organizational efficiency by enhancing enterprise's information processing capability (Usman and Ahmad, 2012). Good cost estimation has a direct impact on performance and efficiency of a business enterprise because an overestimation can result in a loss of profits and goodwill, whereas underestimation may lead toward financial losses. The stages that ERP is not integrated into could be characterized as less defined stages highly uncertain and complex. That type of knowledge is totally dependent on experiences and competences of people and there is a high risk for it to be lost temporally or permanently. ERP in this case serves as a retention measure, but only for information that is standardized. Moreover, a lot of specific information, that usually constitutes main drivers in customized production is left outside the scope of ERP.

The human ability to rely upon their experience may be used as a good opportunity to deal with uncertainties by referring to specialist expertise in making precise calculations. For instance, designers may refer to it in making product development strategies, engineers may use it to forecast duration of manufacturing processes while managers enjoy better opportunities in marketing. Specialist experience may facilitate dealing with conflict in decision making processes and the ERP, including various employees, may grant a reliable cost estimation system if it could account for previous mistakes and employee experience. Expert involvement into order processing from the initial stage already may have a twofold effect: first, it may grant additional data necessary for material and time expenditure estimations and second, it increases employee satisfaction. The research has revealed that employees who fit into the company well feel more satisfied with their jobs, are more prone to stay in the company and produce better results. ([Gleeson](#), 2017).

Knowledge retention for cost estimation in customized manufacturing. Cost estimation in the early stages of product manufacturing helps accelerate production

time, reduce costs and increase quality and competitiveness in the free market. Complexity and machinery costs are important variables to estimate the final cost of the product. However, current cost estimation models only consider calculations based on the design which has been determined beforehand, thus it is very difficult to apply a cost estimation model early in the design process because of insufficient information (Budiono *et al.*, 2014).

Cost estimation plays an important role in the product development cycle (Duverlie and Castelain, 1999). Proper cost estimation will simplify the process of determining the profit to be obtained and advantages against competitors and cut down on investment in new tools. The key factors in pricing are knowledge retention and preservation and critical knowledge in customized manufacturing. When setting prices, it is very important to clearly identify preserve and analyse critical knowledge since accurate data reduces the need to rely upon experiences (intuitive grounds) or look for product similarities (analogy grounds). A detailed quantity estimation of expenses may be grounded on analysis of extensive data on critical knowledge, including parameter or analytical methods. Differences between the parameter and the analytical method depend on the level of comprehensiveness of the critical knowledge (Niazi *et al.*, 2006).

2 Methodology

The research was based on a semi-structural interview method. A two year long (2017-2018) qualitative case study has been conducted within a sample of two furniture companies operating in Lithuania with the aim to find out how the companies recognize knowledge they would like to preserve and what strategies they apply to cope with uncertainties of customized orders. Companies selected for the research expose strong orientation towards customized manufacturing. Also, both companies are innovation oriented and face pricing issues at the construction stage. The interviews were organized so as to find out how companies deal with uncertainties while costs are being estimated. At the same time knowledge preservation issues were dealt with on the basis of the organizational behaviour.

The data set included 18 interviews with a wide range of specialists: CEOs, managers, product developers, constructors, etc. All interviews were eventually transcribed. The responses were grouped into categories and subcategories by means of qualitative data analysis software NVivo. A total of 174 pages of text and 905 coded notions were grouped into four generalized categories: the price estimation, the organizational structure, the employee engagement and the production processes. Having made quality attribution to the categories, the collected interview data were compared to each other to reveal fundamental similarities and differences between approaches of individual respondents.

The interview data were recorded and transcribed by means of NVIVO software. Text segments that are meaningful for the subject under survey were selected. Later terminology of the selected text segments was interpreted in view of the context and ascribed to corresponding categories. Individual concepts were ascribed synonyms - words having an identical or similar meaning to [that of the chosen](#) terms. Later, the

respondents were classified according to the similarity of the terms they used and their relations with other respondents. Interrelationships of the respondents were identified in accordance to their expectations and problems associated with knowledge preservation in the course of customized manufacturing. Each text segment was encoded in a corresponding category by ascribing it a source and references. Each category was subsequently split into subcategories and text segments were divided into words and word units. The accurate division allowed distinction of syntactical relations between individual word units, that may not be identified by addressing wider categories, such as [sentence parts](#) or text segments. The research included various stakeholders who had used different concepts to describe the same problem. The major part of encoded data was associated with the pricing process; thus, the category of price estimation constitutes 40 percent of the analysed data.

Open questions allowed the respondents to give their opinion about critical knowledge about pricing uncertainties, organizational structure, employee involvement and manufacturing processes, which is lost despite attempts to preserve.

3 Findings

Before analysing which retention approaches are more suitable for customized manufacturing and price estimation, all manufacturing processes have been studied with the purpose to define critical knowledge for pricing.

Early process of price estimation and the points for retention.

A new customized manufacturing order begins with price estimation right at the first interaction with the client. Although there are several dominant pricing methods, most of companies working in customized manufacturing attempt to set the price as precise as possible already during the order acceptance stage (Baldinger M. et al. 2016). The researched companies as well as other companies in the sector (source) usually account quantities and types of used materials, operational times and the costs of assembly and packaging and add flat rate quite accurately. The price also includes expenses on designing and manufacturing preparations. The process of price estimation is predetermined by the customary production process (designing, prototyping, manufacturing, assembling, testing) and all associated expenses are estimated during the planning phase. Essential differences in approaches towards pricing precision and the cost estimation process are usually caused by different approaches to company performance and expert competences.

Both researched companies *“evaluate the costs of used materials on the basis of the average prices in the market”*. Therefore, particular attention is paid to the product structure that helps identify the necessary amounts and types of materials and proper technologies to be used. Manufacturing technologies, necessary operations and operational time are also observed to be included into the price. The bigger the company, the more often coefficients and percentage are used to assess *“time expenditures and prices of materials yielding the percentage of supplementary supplies”*. These factors are key to inaccurate pricing. However, businesses acknowledge that the calculations also include an element of guessing, based on intuition and experience

rather than on rational grounds: *“accurate calculations are impossible”, “we have to go with the gut feeling”, “when the amounts are considerable, precise calculations are necessary, if it is only one unit, speculation is OK “.*

To sum up, it can be stated that the degree of precision in pricing is greatly dependent on culture-based retention strategy and the way critical knowledge is identified. Those who rely on pricing of previous orders without reference to detailed drawings often maintain an approach that critical knowledge is stored in their heads and the remaining data is in the ERP system *“suggested the price at random and when the client asked to change the material, we just invented another price”.* Such approach implies an idea that ERP is designed only to store data or perform limited functions. The respondents acknowledge that setting the price at random is a quite usual practice grounded on experience and intuition *“when you are asked the price, you just think for a while and tell and you have to hit the right number”.* Other companies stick to the idea that every case is critical and analogues are impossible to accumulate, and therefore it is crucial to make a prototype design that allows correct pricing already in the pre-order stage: *“each design must have a prototype”, “we make numerous calculations and have a library of calculations for a great deal of designs”, “calculations and assemblage are made by the same people..., in the course of calculations they learn the design and then they can proceed to assemblage”.* The different approaches reveal an obvious discrepancy in the cultural approach.

The study showed, that estimation of custom-made furniture production costs is usually a predictable process based on the account of furniture size (11.6%), production time (25.2%), design similarity (8.8%), used materials (26.1%) marketing (9.0%) and know-how (19.3%).

Table 1. Factors determine the final price

Factors	Data, facts, information	Percentage
furniture size	meters, sq. meters, units, length, width, height, thickness, etc.	11.6
production time	preparation, assemblage, coating, packaging, gathering, storage, etc. Durations of individual operations, the total time expenditure.	25.2
furniture similarity	comparative analysis	8.8
used materials	metal, wood, plastic, rare materials, etc.	26.1
market segment	market observation, analysis	9.0
Know-how	experience, observation, intuition	19.3

Interaction-based approach (understanding the process and practices)

The key participants in pricing include senior managers, accountants, engineers and sometimes even the CEO. In terms of specific calculations, it has to be stressed that the task is always given to specially appointed people or an individual department in cases of big companies. Big companies typically have special pricing departments. The role these departments perform and their place in the organization's hierarchy make a very important element in a manufacturing company. In most cases, orders are first taken by the design department and later sent to the pricing department for price calculation and sent back to the design department *“the costs are estimated by the pricing department and then submitted to the design department”*. Functions of the pricing are quite clear and strictly set whereas responsibilities of the design department are much wider and more diverse, such as *“setting a mark-up”*. More complex issues are discussed with departments. The model is primarily based on a horizontal cooperation between different departments; however, the final decision is made by the top manager, i.e. the director. The data analysis has revealed the presence of a strictly hierarchical model as well, where decisions are made at the top level excluding any element of liberalism: *“we ask the managers or deputy managers who have more experience in similar situations”, “I ask the director if they have any ideas”*.

The research has revealed that company's reputation makes one of the most important factors in customized furniture manufacturing *“in most cases the price is already agreed and cannot be changed even when it is incorrect”*. Therefore, the statistical review of the codes has revealed that pricing and cost estimation (table 2) are among the most frequently mentioned statements while the respondents distinguished the issue as the most topical problem. The most frequently mentioned problems include: *“price”* (weighted percentage 0,97%), *“materials”* (weighted percentage 0,91%), *“data”* (weighted percentage 0,96%), *“cost”* (weighted percentage 0,77%), *“manufacturing”* (weighted percentage 0,94%), *“designing”* (weighted percentage 0,89%), *“ordering”* (weighted percentage 0,66%). The words were being generated with all possible endings, affixes, supplementary words and word units.

Table 2. Percentage of the most frequently used words

Words*	Weighted percentage %
now, today, presently, present, actually and etc.	1.11
need, needed, must, have and etc.	1.01
price, prices, prime cost and etc.	0.97
data, facts, information and etc.	0.96

material, materials, substances and etc.	0.91
production, manufacturing and etc.	0.94
project, drawings, sketch, draft, scheme and etc.	0.89
manager, management, leader, head, director and etc.	0.86
missing, lost, disappear and etc.	0.79
and etc.	-----

* the percentage of the entire respondent text. The analysis excluded words composed of minimum characters and words that make no main parts of the sentence.

ERP functionalities and a point for intervention in retention

Both companies have been extensively using ERP for over 3 years. Long interviews have revealed that companies willing to control their customized production processes, recognize ERP as a potential instrument necessary for knowledge management in the first place. Although each company has undergone different stages in their development, face different constrains of ERP deployment and rely upon different motivations, the role of ERP in the process of price assessment is comparable and symptomatic in both cases.

Therefore, in addition to the professionally constructed ERP, companies intensively use previously developed IT modules for each specific production function, including models for designing, data storing and cost estimation. That comes in line with the knowledge management systems they used before ERP implementation. Additional modules aiming to combine the previously used knowledge management systems with those improved by ERP are being developed at the same time. On the one hand, the modules tackle specific tasks that sometimes fall out of the scope of the new data management tool. On the other hand, the modules generate data and information essential for other stages of the customized production that needs to be stored and retrieved on certain occasions. However, the ERP is given only aggregated data. It seems that an ERP adds value to the operational management and supports production bypassing processes of designing, logistics, planning and cost estimation. The majority of the respondents have acknowledged that *“ERP is not used during the initial stage of manufacturing and is referred to only when the product has undergone all stages of manufacturing resulting in a standard sample and production of the first consignment. Then the data may be stored in ERP”*. It also turned out that ERP is only *“partially adapted to pricing”*, and its main function is to store data *“it is now being implemented and by no means is ideal, but already contains abundant data”*. The analysis shows that companies attempt to fully benefit from ERP *“we draw diagrams, make analysis and describe processes”*;

however, the respondents also observe many uncertainties in ERP processes “we have to make descriptions on our own to get the idea of how to use the ERP”.

vn	m	m2	m10	m20	m30	m40	w50	w70	w80	w90	kaina	Id
0	9.3618	0	0.0167	0.0167	0.0167	0.0167	0	0	0	0.0167	41.11	36

Figure 1: ERP data sample (modified)

Critical knowledge in the stage of price estimation

To identify which knowledge is critical, selective criteria have been set.

- Statements frequently reiterated by the respondents in a great deal of contexts are thought to be critical knowledge.
- Statements including a shade of doubt and containing such phrases as “*I know from experience*”, “*I know the risks*”, “*I feel*” are few and not dominant and are usually uttered only when asked. They also constitute critical knowledge, but companies are still uncertain of how to deal with it.
- Critical knowledge may also be spotted in statements taken from the context, such as “*at the moment it is not important*” or “*we focus on other problems*”, uttered by respondents without an emphasis or even perception of their importance.

The statistical review of the codes under research has shown that some of the statements are more important for the stakeholders than the remaining (table 2) when dealing with the price estimation stage. Statements were given the status of critical knowledge on the basis of their importance within the context. Correlations of all generated statements and words are statistically meaningful. Thus, all text segments are interconnected and may be used for factor analysis.

Table 3. Critical knowledge during price estimation stage

Words*	Weighted percentage %
price, prices, prime cost and etc.	3.04
material, materials, substances and etc.	2.75
project, drawings, sketch, draft, scheme and etc.	2.63

time, times and etc.	2.22
calculate, count and etc.	1.99
operating, operative and etc.	1.89
quantity, amount, total and etc.	1.05
detail and etc.	1.85
product, commodity, item and etc.	1.33
compatibility and etc.	0.87
and etc.	-----

* the percentage within the category of the price estimation respondent text.

It has been noticed that statements containing doubt constitute critical knowledge but companies fail to understand the fact and tend to neglect it „*I know from experience that a more modern product always costs more*”. The above-mentioned critical knowledge should be stored in company's ERP or similar systems giving it proper importance. The research has also revealed that critical knowledge respondents often refer to include the ways of material processing and operational timescales. These are factors that mostly predetermine product pricing and therefore such information is collected, stored and analysed. Attempts to automate and standardize processes on the basis of major factors present new challenges, such as storage and use of massive amounts of data in customized manufacturing. Standardization, for instance of operational timescales, helps coordinate problem solution and meet set standards or achieve set results; however, the process remains within the standard that automatically is not suitable in individual cases: “*since manufacturing is standardized, the workers have no control of cutting processes and the cost of material increases significantly leaving no option but to include the cost of the entire sheet into the price*”. Also, standardization sets a strict framework for employees that is irrelevant in customized manufacturing: „*you can clearly see the lack of independence*”.

The analysed ERP data revealed that businesses are trying to standardize the ways of material processing, such as preparation, assemblage, coating, packaging, gathering and storage. Also, certain units of measurement are being used, such as meters, square meters, units, etc.

5. Discussion

The collected quality data allowed reconstruction of the process of early cost estimation for a new order. The precise cost estimation process during the manufacturing cycle is described in figure 1.

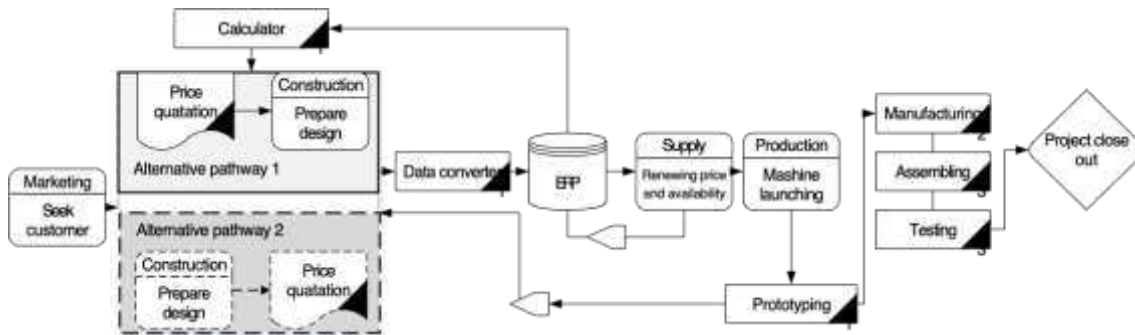


Figure 1. The precise cost estimation process and ERP role

The process starts with communication with a client and identification of the client needs to be followed by the price quotation, and on the agreement with the client, the order is confirmed and the order's life cycle launches with a drawing of the product design. Already during the stage of price quotation, critical knowledge accrued within the ERP are drawn on by means of specialized IT modules (calculation engines). The same critical knowledge is used in the development of the specific design. Communication between individual stages of manufacturing and the data base (ERP) is established via intermediary modules. During the stage, data for storage and subsequently for manufacturing process monitoring are collected.

While manufacturing processes are similar and the key procedural stages are coincident in both companies, the cost estimation stages expose noticeable differences. One company proceeds to price quotation only after having produced design drawings while the other quotes prices before any drawing are completed.

Although price quotation takes place within the earliest stage of the manufacturing process, its quality and precision greatly depend upon critical knowledge only emerging during the later stages of manufacturing. The critical knowledge that is converted into ERP format and stored in the ERP until the feedback loop submits it for designers and cost estimation departments constitute the grounds for price precision.

It is now the time to discuss the most important retention strategies and their manifestation in customized manufacturing and the ERP role within the entire knowledge retention pathway

Technology based retention. Technology based retention is realized by means of different IT instruments, e.g. ERP and IT modules for specific functionalities. An interesting fact is that only part of information generated within the stages of client liaison and designing is converted into an ERP friendly type. The solution is grounded on

the necessity to present only data valuable for production monitoring. The remaining knowledge (for instance, data regarding individual operating time spans) is left either to be stored in additional IT modules or memorized by employees. The ERP in this case serves as a retention measure only for information that is standardized. Moreover, any specific information, which usually is the main driver in customized production, is left outside the ERP scope. The stages that ERP is not integrated into could be described as less defined ones, earmarked by high uncertainty and complexity.

Interaction-based retention (records on the process and practices).

The human ability to rely upon their experience may be used as a good opportunity to deal with uncertainties by referring to specialist expertise in making precise calculations. For instance, designers may refer to it in making product development strategies, engineers may use it to forecast duration of manufacturing processes while managers enjoy better opportunities in marketing. Interaction based retention becomes important the procedural stages where ERP fails to safeguard smooth recovery if data interfaces. Obviously, ERP may become a valuable instrument only when it is able to learn from previous mistakes and employee experience, which takes a proper data interface along with an extensive database. Since ERP is introduced as a standardized product, it often tries to compensate retention strategy breakdowns by expert involvement into all stages of the order's life cycle.

Culture-based retention (best practices of professional interaction)

The fact that precise cost estimation based on construction design competes with cost estimation based on average prices and experience shows that companies tend to rely upon culture-based retention. Apart from approaching the limits of price precision, the latter includes approaches to formal expert abilities, collaboration and the willingness to learn critical knowledge and store it in a formal way.

6 Conclusion

The present research focuses on the process of customized manufacturing as a complex combination of interrelated stages, and the role of ERP as an instrument for knowledge retention. An in-depth analysis into the process reveals that the knowledge retention stimulus arises from the company's willingness to manage complexity of cost estimation. However, this objective is only realized partly. ERP is used mainly for production management and process monitoring whereas other objective such as knowledge preservation for future strategic decisions remain obscure. The failure might be caused by difficulties in recognition of critical knowledge. The urgency of operational tasks such as production process monitoring, tight deadlines in the production process and the need to strictly follow agreed patterns and construction designs mask the necessity to preserve specific knowledge and raise additional tasks for knowledge management. The complexity of the nature of critical knowledge for cost estimation derives from specific links between data. However, the links are not stored in the ERP and need additional research to be formalized.

Our research contributes to the stream of literature maintaining the idea that a knowledge management system based on IT modules in combination with a standardized ERP increases knowledge preservation capabilities even for companies with a personalized production portfolio. Knowledge preservation functions operate with an open-ended chain for an employee input at any knowledge processing stage especially in cases of high uncertainties (estimation of the costs and time expenditure, dealing with product quality issues).

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Teaching and Learning in the Knowledge Economy

Do Managers have an Illusion of Explanatory Depth in Digitalization?

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Abstract:

In this paper we focus on one aspect of managerial overconfidence, the illusion of explanatory depth (IOED). We extend the current research to the question “do managers realize how well they understand digital technologies and their future impact on their business models”. Three experiments with a total of 358 international managers show that there is a significant IOED among managers concerning their understanding of digital technologies. The study also shows that ad-hoc visualizations, like sketches, help to reduce the IOED by making gaps in one’s knowledge explicit and create a disfluency in thought to recognize one’s overestimation of knowledge.

Keywords:

Strategic decision making, cognitive biases, overconfidence, illusion of explanatory depth, debiasing, visualization

1 Introduction

“No problem in judgment and decision making is more prevalent and more potentially catastrophic than overconfidence” (Plous, 1993, p. 217).

The influence of cognitive biases on decision-making has been long recognized starting with the seminal work of Tversky and Kahneman (Tversky & Kahneman, 1974). The literature on irrational decisions has surfaced potential flaws in human decision-making (Bazerman & Moore, 2009; Einhorn & Hogarth, 1981; Hogarth, 1987; Kahneman, Slovic, & Tversky, 1982; Slovic, Fischhoff, & Lichtenstein, 1977) leading to several classifications based on *psychological* (Arkes, 1991; Bazerman & Moore, 2009; Gilovich, Griffin, & Kahneman, 2002; Oreg & Bayazit, 2009; Stanovich, West, & Toplak, 2016; Tversky & Kahneman, 1974) or *managerial* approaches (Arnott, 2006; Carter, Kaufmann, & Michel, 2007; Dimara, Franconeri, Plaisant, Bezerianos, & Dragicevic, 2019; Hogarth, 1987; Remus & Kottemann, 1986; Schwenk, 1984). The significance of these biases in *managerial* decision-making (e.g. in strategic management decisions) has been shown extensively (Barnes Jr., 1984; Bateman & Zeithaml, 1989; Das & Teng, 1999; Lovallo & Kahneman, 2003; Powell, Lovallo, & Fox, 2011; Schwenk, 1984, 1986; Simon, 1987), with a recent move to integrate aspects of cognitive and social psychology in strategic decision-making (Hodgkinson & Clarke, 2007; Levinthal, 2011; Powell et al., 2011; Sibony, Lovallo, & Powell, 2017).

According to Johnson and Fowler (2011, p. 317) overconfidence is “one of the most consistent, powerful, and widespread” cognitive biases and has reached – in the area of entrepreneurship – a peak of attention (Thomas, 2018). Overconfidence regards one’s own judgements (Brenner, Koehler, Liberman, & Tversky, 1996; Stanovich & West, 1998) and abilities (Baumann, Deber, & Thompson, 1991; Camerer & Lovallo, 1999; Johnson, 2004; Mahajan, 1992; Malmendier & Tate, 2005; Oskamp, 1965): “People are consistently overconfident in their ability to perform difficult or impossible tasks with which they have some minimal familiarity” (Fischhoff & Slovic, 1978, p. 797). But overconfidence is also present in an unrealistic optimism about one’s future (Weinstein, 1980), and in strategic judgment of CEO’s (Park, Westphal, & Stern, 2011).

Overconfidence is known as a “positive illusion” (Haselton, Nettle, & Andrews, 2015; Taylor & Brown, 1988) consisting of different phenomena: a) an unrealistic positive view of the self (Taylor & Brown, 1988, p. 195) or exaggerated personal qualities and capabilities (Johnson & Fowler, 2011, p. 317), b) the illusion of control (Johnson & Fowler, 2011, p. 317; Taylor & Brown, 1988, p. 196), and c) unrealistic optimism (Taylor & Brown, 1988, p. 196) or negligence to risk (Johnson & Fowler, 2011, p. 317). Moore and Healy (2008, p. 502) summarize these phenomena as “overestimation” and add *overplacement* (people believe to be better than others) and *overprecision* (an excessive certainty about the accuracy of one’s beliefs) to the concept of general overconfidence.

Thus, the concept of overconfidence is differentiated as a bias in self-judgement (Haselton et al., 2015), an illusion of judgement (Pohl, 2017), a bias in estimation (Dimara et al., 2019), in information processing (Hogarth, 1987), or a verification bias to achieve consistency in one’s core self-evaluations (Oreg & Bayazit, 2009) – to balance

an accurate self-evaluation and the individual esteem maintenance (Alicke, 1985). We can summarize this as “self-confirmatory information processing”. This threatens the quality of decision-making as overconfidence crowds out decision aids, ignores the base rate, fosters groupthink (Arkes, 2001, pp. 496–497) and induces a failure to consider alternative perspectives. It can lead to a failure to distinguish inferences from assertions, favouring positive over negative information, an unwarranted certainty in the prediction of accuracy, and a feeling of power (Kissinger, 1998, pp. 21–22). Overconfidence increases in “unfamiliar or poorly understood strategic contexts” (Johnson & Fowler, 2011, p. 319), and “when organizations undertake novel tasks and when top managers, who do not face strong social feedback from peers, are the ones taking action” (Dunning, Heath, & Suls, 2004, p. 93) – thus “precisely the most dangerous of situations” (Johnson & Fowler, 2011, p. 320).

Therefore, *debiasing* – or disillusioning these positive illusions – helps to improve the quality of decision making and, as a managerial consequence, improves returns (Kahneman, Lovallo, & Sibony, 2011; Lovallo & Sibony, 2010). In section 2 we focus on one illusion contributing to overestimation, the illusion of explanatory depth (IOED), to build our hypotheses for the discovery and debiasing of this illusion.

2 Theoretical Foundation and Hypotheses Development

The illusion of explanatory depth (IEOD) refers to “people’s limited knowledge and their misleading intuitive epistemology” (Rozenblit & Keil, 2002, p. 522) in the context of *complex causal patterns* (Fisher & Keil, 2016). Rozenblit and Keil (2002) have shown that an IEOD can be observed as an overconfidence in explaining devices and natural phenomena. In addition, they have shown a modest overconfidence in geographic facts, but no such overconfidence regarding narratives of movies and procedures.

These findings were replicated as an IOED for devices (Alter, Oppenheimer, & Zemla, 2010; Mills & Keil, 2004; Roeder, 2016; Silk-Eglit & Kurtz, 2011; Zeveney & Marsh, 2016), for political policies, positions and voting (Alter et al., 2010; Fernbach, Rogers, Fox, & Sloman, 2013; Roeder, 2016; Voelkel, Brandt, & Colombo, 2018), mental disorders and treatments (Zeveney & Marsh, 2016), science based behavioral recommendations for health improvement and climate protection (Bromme, Thomm, & Ratermann, 2016), and even how products work (Fernbach, Sloman, Louis, & Shube, 2013). In all of these contexts, the participants believed to understand a phenomenon better than they actually did.

A central mechanism for debiasing or discovering the IOED, according to Fischhoff (1982), consists of *making knowledge explicit* which helps to correct “faulty judges” – by “creating a general bias awareness” (Kaufmann, Carter, & Buhrmann, 2010, p. 803), thus adding an outside perspective (Dunning et al., 2004) to consider the unknowns in one’s knowledge (Walters, Fernbach, Fox, & Sloman, 2016). This is a way to mitigate this bias or in other words: “one must have a way of sensing when there are gaps in one’s knowledge that make one’s understanding so flawed that it is inadequate for use in a task” (Keil, 2007, p. 2037).

The experimental procedure of Rozenblit and Keil (2002) already helps to identify the illusion of explanatory depth. Existing research shows that general overconfidence influences management decisions (Busenitz & Barney, 1997; Camerer & Lovo, 1999; Malmendier & Tate, 2005). But until now, the phenomenon of the IOED has not yet been shown for the population of experienced managers with a responsibility for strategic decisions. It has neither been shown for managerial topics with complex causal patterns, fitting the definition of “explanatory, theory-like knowledge that may converge to convince people they have vivid, blueprint-like senses of how things work, even when their actual knowledge is skeletal and incomplete” (Rozenblit & Keil, 2002, p. 522). Existing studies focus on graduate or undergraduate students (Alter et al., 2010; Bromme et al., 2016; Lawson, 2006; Roeder, 2016; Rozenblit & Keil, 2002; Silk-Eglit & Kurtz, 2011), cycling experts (Lawson, 2006), children under 12 years (Mills & Keil, 2004) or a sample of adult participants from Amazon MTurk or an online panel with no specific background (Alter et al., 2010; Fernbach, Rogers, et al., 2013; Fernbach, Sloman, et al., 2013; Roeder, 2016; Voelkel et al., 2018; Zeveney & Marsh, 2016).

The complex causal patterns of *digital technologies* and their impact on management decisions are now central to strategizing (Berghaus & Back, 2016; Ismail, Khater, & Zaki, 2017; Rachinger, Müller, Rauter, Vorraber, & Schirgi, 2018; Westerman, Calmédjane, Bonnet, Ferraris, & McAfee, 2011; Yoo, Henfridsson, & Lyytinen, 2010). Thus, our goal is to uncover the phenomenon of the IOED for managers regarding their understanding of their knowledge of digital technologies. Following Gaviria, Corredor, and Zuluage-Rendón (2016) the high social desirability of knowledge about digital technologies among managers could generate a strong IOED for this topic and therefore leading to our hypothesis 1:

H1: The IOED can be observed among experienced managers with regard to their understanding of digital technologies.

Russo and Schoemaker (1992) already suggested *visual support* as cognitive remedies to overconfidence (i.e., fault tree or scenarios) a trend which is supported by indications that visualizations like diagrams, maps, sketches, or metaphors (Eppler & Burkhard, 2007) can improve reasoning (Bauer & Johnson-Laird, 1993) and comprehension (Tversky & Kessell, 2014) by visualizing thought (Tversky, 2011). This follows a recent “visual turn” in management and strategy research (Eppler & Platts, 2009; Ertug, Gruber, Nyberg, & Steensma, 2018; Knight, Paroutis, & Heracleous, 2018; Paroutis, Franco, & Papadopoulos, 2015; Tarakci et al., 2014) and the understanding that mental representations enable managers “to see things they were not aware of, and this insight helps them to define new questions, hypotheses, and models of their data” (Van Wijk, 2005, p. 3).

As Guri-Rozenblit puts it, visual representations are “more effective than verbal explanations in representing sequential and hierarchical relations” (Guri-Rozenblit, 1988, p. 219). One reason for this effect of visualizations is based on the two affordances of illustrations: *system topology* and *component behavior* (Mayer & Gallini, 1990). Illustrations allow to show the major components of complex causal patterns (system topology) and the interaction of these components (component behavior) which supports building mental models or mental imagery (Paivio, 1969). Another approach supporting a superior role of visualizations in disillusioning the IOED is the provisionality

or small degree of perceived finishedness (Bresciani, Blackwell, & Eppler, 2008; Hundhausen, 2005) of self-drawn sketches, creating a “disfluency”, an “interruption of the smooth flow of thought” (Ellis, 2018, p. 123) which enables the cognitive decoupling to override the thinking error of “default to the autonomous mind” (Stanovich et al., 2016, p. 49) where the IOED would not be recognized and no self-adjustment would take place. This structuring and externalizing of original internal or implicit knowledge (Brockmann & Anthony, 2002; Mengis & Eppler, 2006) thus helps being more accurate in the correction of positive illusions like the IOED by showing the gaps in one’s understanding of complex causal patterns and producing a disfluency. This leads to our second hypothesis:

H2: A visual self-explanation leads to a stronger correction of the IOED than a textual self-explanation.

3 Experiments Sequence and Designs

Both hypotheses have been tested in a sequence of three experiments (a preliminary experiment and two main experiments). All three combined a within-subject element (the test for IOED) and a between-subject element (testing the visual debiasing) – a design recommended by Charness, Gneezy, and Kuhn (2012, p. 7). The experiments partially replicated the original study 1 by Rozenblit and Keil (Rozenblit & Keil, 2002) to document the IOED, following the procedure and the measures of the self-rating. To test the two mentioned hypotheses our experiments focused on the first three phases of the original experiment, the phases 4-5 were discarded, as in study 4 from Rozenblit and Keil themselves (2002, p. 532).

To enable the execution of the preliminary experiment in short workshops with managers, our first study only focused on one question: “How well do you understand how Google ranks its search results?”. The objective of this study was to prove if there was an IOED and to pre-test if a visual self-explanation could lead to the same or even a higher correction of the IOED.

The two main experiments integrated seven key digital technologies mentioned by Forbes as digital trends for 2018 an ongoing (<https://www.forbes.com/sites/danielnewman/2017/09/26/top-10-trends-for-digital-transformation-in-2018/#42fc2926293a>) and with the context of having an impact on strategic decisions of a company. These seven technologies were: *artificial intelligence, blockchain, internet of things, 5G mobile, virtual reality, augmented reality, big data analysis*. The first objective of both main experiments was to prove an IOED either in the basic understanding of how the technology works (main experiment 1) and in the understanding of how this technology will influence one’s own business model within the next 5 years (main experiment 2). The second objective was testing the concept of visually debiasing the IOED.

The following sections will describe the detailed design of the experiments and show the results from a sample of 358 managers.

3.1 Preliminary Experiment

3.1.1 Subjects and sample size

The experiment was conducted during strategy and communication workshops and trainings with European managers from different countries and industries. As a result, 214 managers (age 25+) participated in this experiment.

3.1.2 Design and procedure

The design of the preliminary experiment included four steps (see figure 1)

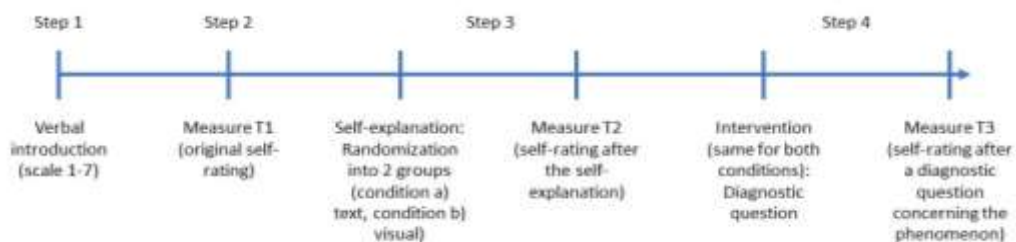


Figure 9: Procedure preliminary experiment

In T1 the participants assessed their understanding of “how Google ranks its search results” individually from 1 (no understanding at all) to 7 (perfect understanding). The participants were then asked to explain their understanding in a detailed description (e.g. criteria used for search ranking) either in a) condition 1: written explanation of b) condition 2: sketched explanation. The participants were randomly assigned to one of the two conditions. After the self-explanation, each participant re-assessed his or her understanding on the scale of 1-7 (T2). The diagnostic question after T2 was: “Why do search results with very few direct links (thus unpopular websites) sometimes still appear on top of the results page (excluding AdWords)? This could lead to a re-assessment again on the scale of 1-7 (T3).

This procedure led to three measures (T1, T2, T3) for each participant.

3.1.3 Results

The first experiment already showed that the concept of an IOED can be applied to digital topics. *There was a significant IOED in the understanding* of how the Google search algorithm works – thus proving the tendency to overestimate one’s own knowledge in this area too.

The results show a significant drop between the self-ratings of understanding from T1 measure T1 (original self-rating), to T2 (self-rating after a self-explanation of the phenomenon), and to T3 (after a diagnostic question concerning the phenomenon): means T1=3.36, T2=3.11, T3=2.84, repeated measures ANOVA: $F(2/639) = 9.7911$, $p < .0001$. (see figure 2).

The *visual debiasing effect could not be observed* in the preliminary experiment, there was no significant difference in the adjustments of the self-rating between the two conditions of the self-explanation. Thus, showing that visual debiasing exists but not with a stronger effect than the textual debiasing.

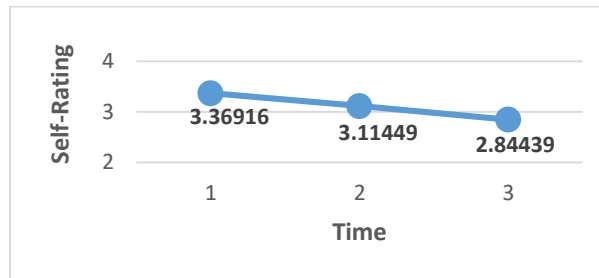


Figure 10: Results IOED preliminary experiment

3.2 Main Experiment 1

3.2.1 Subjects and sample size

For the first main experiment, we enlisted the participation of 78 managers (age 25+) which enrolled in management seminars and workshops as well as post-graduates of an MBA class. The duration of this experiment was approximately 30 minutes.

3.2.2 Design and procedure

The experiment consisted of a pre-survey testing for *active-open-minded-thinking* and 4 experimental steps mainly replicating the original IOED-experiment by Rozenblit and Keil (Rozenblit & Keil, 2002) – see figure 3.

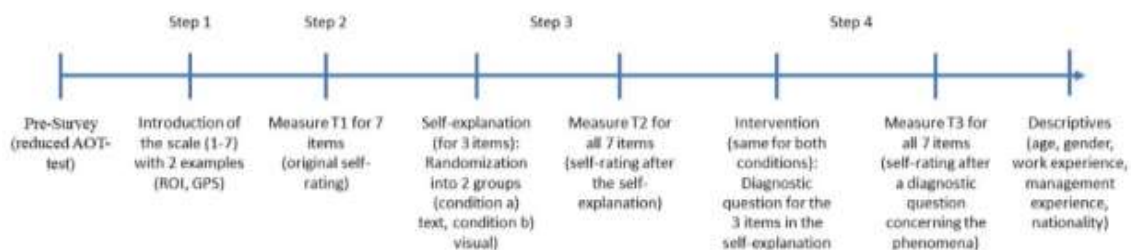


Figure 11: Procedure main experiment 1

Pre-Survey: The influence of cognitive dispositions on the IOED adjustment is indicated by Alter et. al. (2010) and Silk-Eglit and Kurtz. Thus, we integrated a test for the “active-open-minded-thinking” (AOT) as a pre-survey before the experiment. The original AOT-test is a part of the CART-test (Comprehensive Assessment of Rational Thinking) (Keith E Stanovich et al., 2016) and helps to check for the potential influence of cognitive dispositions as moderators of mode effects (see West, Toplak, & Stanovich, 2008). The AOT-test, consisting of 30 items, has “by far the strongest correlate of CART performance” (Stanovich et al., 2016, p. 243) and is thus a strong predictor for epistemic rationality and instrumental rationality, the factors CART measures. The CART-test takes more than 3h to finish (with a shorter version still 2h) which is not appropriate for our experiment thus, using the AOT-part only as pre-survey allowed us to conduct the experiment during “normal” management seminars and workshops. To optimize the

duration of the experiment and keep it under 30 minutes, the AOT-version of Svendholm-Häkkinen and Lindeman (2017) was used. They developed an AOT-test with 17 items “highly correlated with the original and showed comparable reliability and criterion validity” (Svedholm-Häkkinen & Lindeman, 2018, p. 37), allowing us to integrate this control variable in the experiment, but still keep the focus on the core effects. The research of Czerwonka (Czerwonka, 2017) and Toplak, West and Stanovich (Toplak, West, & Stanovich, 2014) both show that cognitive abilities predict the impact of an anchor bias and therefore a *high AOT-rating should lead to a more accurate primary self-assessment* in explanatory knowledge.

Step 1 – Calibration: To indicate their level of understanding the participants learned to use a 7-point scale to rate their understanding (deep, partial, shallow) of complex causal patterns on two training examples (the understanding of the concepts of ROI and GPS – the second example is taken from the original experiment).

Step 2 – Measure T1: The participants rated their level of understanding (T1) concerning the seven digital technologies artificial intelligence, blockchain, internet of things, 5G mobile, virtual reality, augmented reality, big data analysis.

Step 3 – Measure T2: For three of these technologies each of the participants was asked to deliver a self-developed explanation. The choice was predetermined and the same for all participants (how do blockchains, internet of things and augmented reality work). The participants were randomly assigned to one of the two mode conditions: 50% of the participants had to deliver a written self-explanation, 50% of the participants a sketched self-explanation. After the self-explanation the participants re-rated their understanding of all seven items (T2).

Step 4 – Measure T3: For each of the three technologies where a self-explanation was provided the participants were asked a detailed “diagnostic question” (e.g. how is a crypto currency build and what makes it work?) which they answer written (for both conditions). Then all participants re-rated their level of understanding for all items (T3).

At the end of the experiment, all participants had to complete a short questionnaire about their background (age, gender, work experience, managerial experience, country of origin).

As a consequence, every participant rated his or her understanding of these seven digital technologies three times: T1 (the original self-rating), T2 (the self-rating after a self-explanation of the phenomenon), and T3 (the self-rating after a diagnostic question concerning the phenomenon).

3.2.3 Results

The mean age of all 78 participants was 38.3 years, 15.0 years of work experience, and 8.1 years of management experience, 56 were males, 22 females. The participants came from 11 different countries (but a majority from Europe) and covered more than 15 different industries.

The analysis of the results shows a *significant drop in the self-ratings from measure T1 to T3*, thus confirming hypothesis 1 of an IOED for managerial topics of digitalization (means T1=3.38, T2=2.79, T3=2.54, repeated measures ANOVA: $F(2/1611) = 31.3658$, p

< .0001) (see fig. 4): *Managers overestimated their understanding of digital technologies.*

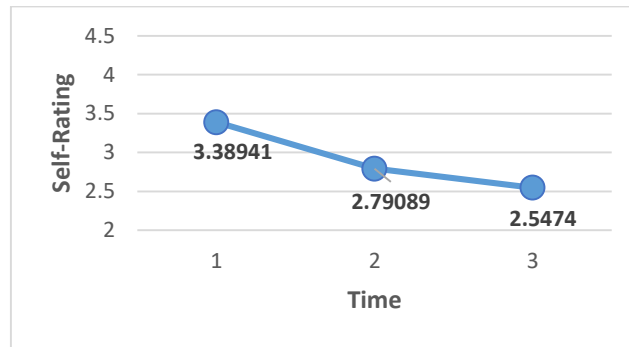


Figure 12: Results main experiment 1: Self-ratings from T1 to T3 – proving an significant IOED

The prediction of hypothesis 2, that a visual/sketched self-explanation (n=38) leads to *higher* adjustment of the self-rating from T1 to T2 than a written self-explanation (n=40) was confirmed. The pooled t-test for the comparison between the visual and the textual self-explanation showed a p-value of .0455 for the upper-tailed test (mean adjustment: text condition = .47807, visual condition= .750595, see fig. 5). *Therefore, managers visualizing their answer were more aware of the limitations of their own knowledge than those with merely a written self-explanation.*

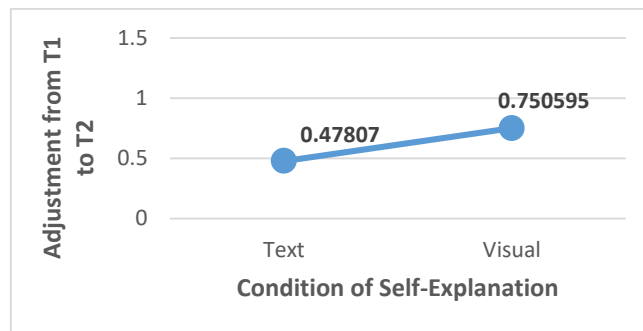


Figure 13: Results main experiment 1: Adjustment of T1 to T2 in both conditions

Looking at the control variables, the actively-open-thinking test, age, work experience, management experience and gender, a general correlation with the adjustment of the self-rating between T1 and T2 could *not* be observed. There was the overall observation that a higher AOT-rating lead to a smaller adjustment in the re-rating as predicted by Czerwonka (Czerwonka, 2017) and Toplak, West and Stanovich (Toplak et al., 2014), but this effect is not statistically significant and reliable (though the observation is significant in the visual condition).

3.3 Main Experiment 2

The main experiment 2 followed the procedure of main experiment 1 step-by-step with one adjustment: The participants did not rate their understanding of a digital technology, but their understanding of how this digital technology will *influence their business model* within the next 5 years.

3.3.1 Subjects and sample size

The mean age of the 66 participants was 37.8 years, 14.6 years of work experience, and 6.9 years of management experience, 52 were males, 14 females. The participants came from 12 different countries (but a majority from Europe as in the main experiment 1) and covered more than 20 different industries.

3.3.2 Design and procedure

The difference to the main experiment 1 was only in the question: The participants rated their level of understanding (T1) concerning the *impact* of the seven digital technologies artificial intelligence, blockchain, internet of things, 5G mobile, virtual reality, augmented reality, big data analysis on one’s business model (eg. “how well do you understand how blockchain will influence your business model within the next 5 years”) and had to deliver a self-explanation (again, written or self-sketched) for three of these items before T2. For everything else we applied the same procedure as in the main experiment 1 (see figure 5).

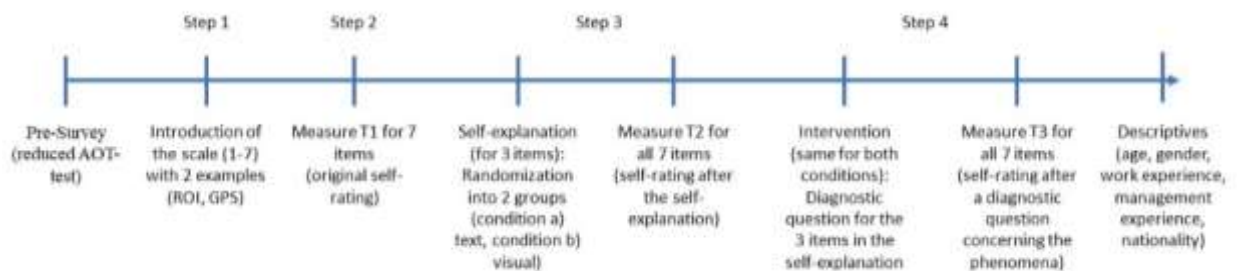


Figure 6: Procedure main experiment 2

As in the former experiments, every participant rated his or her understanding of the strategic impact of these seven digital technologies three times: T1 (the original self-rating), T2 (the self-rating after a self-explanation of the phenomenon), and T3 (the self-rating after a diagnostic question concerning the phenomenon).

3.3.3 Results

The IOED can also be observed for the understanding of the *impact* of digital technologies on one’s business model, thus again confirming hypothesis 1 concerning the existence of an IOED for managers and managerial topics (means T1=4.42, T2=3.98, T3=3.64, repeated measures ANOVA: $F(2/1383) = 18.0542$, $p < .0001$) (see fig. 6): *Managers overestimated their understanding of the impact of digital technologies.*

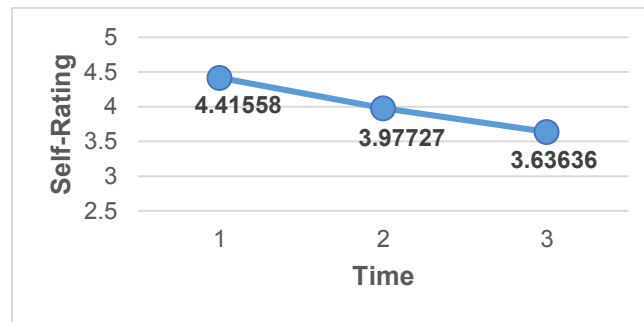


Figure 7: Results of the main experiment 2: Self-ratings from T1 to T3 – showing a significant IOED

In the case of the understanding the impact on the strategy, hypothesis 2 could not be confirmed. The result shows a slight but not significant difference in the adjustment of the self-rating from T1 to T2 (mean adjustment text condition: .321429, mean adjustment visual condition: .5625, p-value of .1618 for the upper-tailed test).

4 Discussion and Further Research

Overall, three experiments have shown the existence of an IOED concerning the understanding of digital technologies and their influence on business models. *Managers systematically overestimate their understanding of complex causal patterns and their impact on their own strategies, creating a “positive illusion” about their own knowledge.* As a consequence, this can lead to flawed decision making in strategic decisions.

How can managers overcome this “positive illusion” in their practice? The results of the experiments show that the externalization of knowledge, the visual representation of one’s understanding of complex causal patterns in the form of sketches, can help to uncover the IOED and this with the same or even stronger impact than a textual self-explanation. An explanation for this strong debiasing effect of sketches combines two characteristics of self-drawn visualizations: first, the affordances “system topology” and “component behavior” through illustrations (Mayer & Gallini, 1990) – which helps to detect gaps in one’s knowledge of complex causal patterns. The second characteristic is the mental disfluency (Ellis, 2018) provided by the provisionality or small degree of perceived finishedness of self-sketched visualizations (Bresciani et al., 2008; Hundhausen, 2005). The creation of a disfluency promotes metacognitive difficulty and thus leads “to deeper processing of the information and less reliance on heuristic modes of processing. In contrast, the ease that is facilitated by fluency leads to greater use of heuristic reasoning, and sometimes more errors in judgment” (Hernandez & Preston, 2013, p. 178).

To sum it up: one aspect of managerial overconfidence is the illusion of explanatory depth in understanding digital technologies and their impact on one’s business models. The process of a self-explanation helps to identify this illusion for managers. In managerial practice self-drawn visualizations support the considering of unknowns about one’s knowledge and debias this illusion.

Further research on this topic should focus on two directions. One is to research if *other modes* of self-explanation can lead to the same result (or are even stronger), like for example an oral self-explanation, which is even closer to managerial practice under time restrictions. A second direction focusses on researching the impact of visualizations and self-drawn sketches in debiasing other cognitive biases (like simplification biases or regulation biases) to improve managerial decision making.

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The Implications of the Industrial Revolutions for Higher Education

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Abstract: The Industrial Revolution can be described simply as a period in history when human beings in several areas of society used machinery to carry out tasks instead of doing them manually. Economists (macro- and micro-) highlight the role of human capital in modern economic development. The evidence of research shows the link between higher education and the Industrial Revolution. Each historical industrial revolution created a system of education that addressed its needs. The current transformation of the knowledge system is changing the education system too. To understand these changes and their implications, we have to understand the fundamental needs of our society. Two core questions will therefore be addressed in our paper: 1) How is the world of higher education evolving? 2) What could higher education look like after the ongoing industrial transitions? Consequently, in this paper we discuss history with the aim of understanding the future. We conclude that all the industrial revolutions influenced the system of education from the beginning as memorisation, through Internet-enabled learning (digitisation), consuming and producing knowledge to the point of innovations. Education outside the classroom is not a desired objective any more, because the student can now learn anywhere and at any time. Almost every field has benefited from advances in artificial intelligence, however this has not included the education industry. We have tried to explore the question of why education is lagging behind.

Keywords: Industrial Revolutions, Higher Education, Artificial Intelligence.

1 Introduction

The Industrial Revolution (IR) can be described simply as a period in history when human beings in several areas of society used machinery to carry out tasks instead of doing them manually. Many historically important technological advances and inventions have led to economic democratisation, globalisation, mass production of goods and industrialisation. It is difficult to determine the exact date of the beginning of this era, but we can look at the earliest application of machine power to work. We argue that one should also take the changeover from agrarian to industrial economies and from autocracy to democracy into consideration.

Looking back over time, the first evidence of human work revolution was the Agrarian Revolution, which involved domestic animals, new farming technologies, food production and population growth (ADB, 2017; Schwab, 2017). This brought about a needed radical change. Four main industrial changes occur in human history. The First Industrial Revolution, from 1760 to 1840, characterised by the era of mechanisation,

including industries mechanised by steam energy, textile, metallurgy and metal works. It can be symbolised by the steam engine and the train. The Second Industrial Revolution, from 1870 to 1914, is represented by innovations in communication, transport and manufacturing – the telegraph, the telephone, Edison’s light bulb, the first flight, Henry Ford’s Model T and others. This period is symbolised by steel. The Third Industrial Revolution, from 1969 to 2000, includes new technologies such as the Internet, the computer and renewable energies that have changed history. Production is done by modern methods using computers. Modern machines symbolise this era. The Fourth Industrial Revolution, also called the digital revolution, has been occurring since the middle of the last century.

Generally, the IR brought employees from their homes to the factories. With information and communication technology (ICT), we have completed the full circle, and the reverse is now possible, where employees are able to move back to their homes again (Simitis, 1986).

Education changed during the industrial revolutions. Every industrial revolution set an important pattern for education, but skilled and more educated workers were and are still required. Standardisation was seen as the appropriate way to encourage education, and this was achieved with standardised classrooms and designs, standardised textbooks and content, and standardised teaching methods. This resulted in mass education. Today, we have many college graduates who have little capacity for original thinking and are in jobs that require little education. We are of the opinion that higher education has to change from education to job training. Furthermore, we would add that it was the development of adding learning to the inventions of technology that gave those in schools the knowledge of how far we had advanced and provided direction for others to pursue. The United Nations stresses that education should be a means to empower children and adults alike to become active participants in the transformation of their societies (Unesco, 2017), and the European Educational Research Association further points to the important role of education in helping people to participate in a democratic society (EERA, 2017).

To understand this phenomenon, we evolved a simple linking scheme that can be applied to the timeline of the four industrial revolutions. Each historical industrial revolution created a system of education that addressed its needs. Using this device, we tried to explore the relationships between industrial revolutions and higher education. Changes in technology, culture and economies are having an impact on higher education. Today’s transformation of the knowledge society is changing the education system. To understand these changes and the implications, we have to understand the fundamental needs of our society. Two core questions will therefore be addressed in our paper: 1) How is the world of higher education evolving? 2) What could higher education look like after the ongoing industrial transitions? Consequently, in this paper we discuss history with the aim of understanding the future.

In the following section, we introduce the four industrial revolutions. The third section presents a brief overview of the history of higher education. The fourth section provides the link between education and the industrial revolutions. In the fifth section, an analysis of the future of artificial intelligence in education is presented. Almost every field has

benefited from advances in artificial intelligence, however this has not included the education industry. The paper closes with our conclusions.

2 The industrial revolutions

Before the Industrial Revolution, small towns and villages were the norm. The governments of most European countries were monarchies where people worked hard for little money. The term Industrial Revolution refers to the shift from an agrarian, handicraft-based and labour-intensive economy to one dominated by machine manufacturing, specialisation of tasks, factories, a freer flow of capital and a concentration of people in cities (Perry, 1989).

Industrial progress varied in different countries, e.g. in England (middle of the 18th century), in France until the French Revolution, in Germany in the 1840s. In Eastern Europe, it was delayed until the last decade of the 19th century (Perry, 1989). In general, this process began in Western Europe, especially in Britain, for many reasons, particularly the range of social classes, widespread production of diverse rural handicrafts (new markets, new methods) and western agriculture. Our society became more industrialised and urban. During the Industrial Revolution, Europe experienced a shift from a traditional, labour-intensive economy based on farming and handicrafts to a more capital-intensive economy based on manufacturing by machines, specialised labour and industrial factories (Spielvogel, 2012).

During the evolution of our society, humankind has relied on inventions, technical evolutions and resources. According to Schwab (2017), industrial revolutions occur when new technologies and world views introduce significant shifts in economic systems and social structures.

As a consequence, five stages of industrial revolution can be distinguished: the Agricultural Revolution (we call it the zero IR), the First, the Second, the Third and the Fourth. The Agricultural IR occurred from 5000 BC until the 18th century and is characterised by horsepower and water, and writing as a communications technology. City states and small villages were the norm (McAllum, 2014). The First IR (in the late 18th century) introduced mechanical production, which was driven by water and steam. The Second IR came in the early 20th century with Henry Ford's moving assembly line and the age of mass production. Both these IRs made people richer and increased urban populations. The Third IR is the digital automation of production by means of electronics and IT. At present, the Fourth IR is characterised by cyber-physical systems as a consequence of the far-reaching integration of production, sustainability and customer-satisfaction that form the basis of intelligent network systems and processes (Bloem et al., 2014). Schwab (2017) also observes the sequence of industrial revolutions as beginning in the second half of the 18th century, with the First IR lasting from 1760 to 1840, triggered by the invention of the steam engine and the construction of railroads and ushering in mechanical production. Late in the 19th century and into the early 20th century saw the Second IR. It was ushered in by the arrival of electricity and the assembly line, which made mass production possible. Often referred to as the computer or digital revolution, the Third IR began in the 1960s, with the development of semiconductors,

mainframe computing (1960s), personal computing (1970s and 1980s) and the Internet (1990s) as the main drivers. The author emphasises that the fourth stage is characterised by a much more ubiquitous and mobile Internet, by smaller and more powerful sensors that have also become cheaper, and by artificial intelligence and machine learning. He adds that the difference between the other three industrial revolutions is the fusion of technologies and their interaction across the physical, digital and biological domains.

In Table 1, we present a clear overview of all the IRs. It can be seen that the first three revolutions drastically improved productivity, created new industries and made fundamental impacts on society (Davis, 2016).

Table 1: IRs over the course of time

Agricultural Revolution (zero IR)	1st IR The era of mechanical production	2nd IR The era of science and mass production	3rd IR Digital era	4th IR CPS era
Handicraft. Green revolution (new crops and new ways of utilising land and labour). Production for market.	Transition from hand production to mechanical production powered by water & steam.	Mass production powered by electricity. Innovations in steel-making process.	Electronics & IT automate production.	Cyber-physical systems.
Powered by horses & water	Steamships, railroads. First power loom.	Petrol engines, airplanes, chemical fertiliser, electricity, radio, telephones. First assembly line.	Semiconductors, mainframe computing, personal computing, Internet, move from analogue to digital. First programmable logic controller.	Artificial intelligence (AI), the Internet of Things (IoT), robotics, nano-technology, 3D.

Sources: Author and sources based on (Bloem et al., 2014; Davis, 2016; McAllum, 2014; Perry, 1989; Schwab, 2017).

3 Higher education in its historical perspective

Craft (1984) noted that there are two Latin roots for the English word “education”. They are educare, which means “to train” or “to mould”, and educere, meaning “to lead out”. In our opinion, to lead others means the ability to lead with the requisite knowledge, methods and ends.

Tertiary education broadly refers to all education (whether public or private) that follows secondary education. Tertiary education is usually distinct from higher

education, which refers more narrowly to education offered at universities and colleges where academic degrees and professional qualifications are awarded. Tertiary education includes education provided by technical and vocational education and training (TVET) institutes, community colleges, nursing schools, research laboratories, centres of excellence, distance-learning centres and many more (Marmolejo, 2016).

During the history of civilisation, institutions of higher learning took different forms. Two examples are the famous universities of Takshasila (Taxila) and Nalanda in the ancient world [13], though whether these Buddhist monasteries should strictly be regarded as universities is open to debate. In Takshasila, higher education was only imparted for particular subjects. Courses were given in both literary and scientific or technical subjects. In Nalanda, the courses were very exhaustive and embraced all Buddhist and non-Buddhist subjects, including disciplines such as astronomy, tantra, medicine, grammar, law and other miscellaneous subjects (Apte, 1961). In ancient China, we also find one of the first institutions providing higher learning in Taixue, the imperial university during the Han Dynasty in 124 BCE (Sun, 2009). In the Middle East, local religious schools known as “madrasa” became the main institutions of higher learning after the Islamisation of the Arab world (Makdisi, 1981, 1990). These schools established educational standards for the dissemination of knowledge that are still applied in present-day universities. The most famous of the madrasas are the Al-Qarawiyyin University in Fez (Arbaoui, 2012) and the Al-Azhar University in Cairo (History of Al-Azhar, n.d.). The Academy of Gundishapur of the Sassanid Empire is also an important example. It offered training in medicine, philosophy, theology and science. The faculties were versed not only in the Zoroastrian and Persian traditions, but also in Greek and Indian learning (Frye, 1993; Hau, 1979; Hill, 1993). Generally, traditional European higher education can be traced to the period of Antiquity, especially in the pre-Socratic period, e.g. the teachers Pythagoras, Socrates, Plato, Epicurus and Stoa. The spread of Christian religion influenced education in Europe. During the Renaissance, monastic schools were developed, and these led to the establishment of cathedral schools (Hudson, 2012). The first official university (in the sense of a higher-learning, degree-awarding institution) was established in Bologna in 1088 (La nascita dell’Università, 2018). Others were Paris (1160), Oxford in 1167, Cambridge (1209), Salamanca (1134), Montpellier (1220), Padua (1222), Naples (1224), Siena (1240), Toulouse (1229), Prague (1348) and Leuven in 1425 (10 of the Oldest Universities in the World, 2018; Compayré, 1902). In this period, having a university was a sign of prestige and a political advantage. The colonisation of the New World led to the export of the European higher education model. The two oldest institutions of higher learning in the New World are the universities of Mexico and San Marcos de Lima in Peru (Brand, 1940). The highest concentrations were in German territories, followed by those of Italy, France and Spain (Frijhoff, 1996). The rapid spread of universities around the globe started at the end of 19th century. This century was influenced by two watershed moments in the history of the university. The first was the Recovery of Aristotle (Fallon, 1980), and the second was the new paradigm of higher education by German philosopher and theologian Friedrich Schleiermacher and Prussian scholar and minister of education Wilhelm von Humboldt (Fallon, 1980). They visualised a model (called the Humboldtian model) of research and studies in combination. Universities built on the Humboldtian model have provided

students with the ability to address difficult problems, which resulted in major scientific breakthroughs with important economic effects (Geiger, 2004).

In the 20th century, globalisation increased the social space, leading to borderless economic, ecological, financial, social, political and cultural dimensions for traditional societies, driven by a world changing at an unprecedented rate, and this includes our university environments. Stueckelberger (2002) emphasises that “the technological and economic speed of globalization has to slow down a bit (decelerate) and the ethical, cultural and political globalization has to speed up substantially (accelerate).” Following the approval of the Bologna Process in 1999 (EHEA, n.d.), the higher education system in Europe is clearly moving towards the US model, where higher education as a public service is no longer a priority.

4 Links between industrial revolutions and education revolutions

After the First IR, there was a demand for more diverse degree options and a greater range of courses to choose from (e.g. *The New Education* (Eliot, 1869)), as in the German university model for postgraduate research. The Second IR is generally associated with modern discoveries and inventions like electricity, the telephone and radio. This period is characterised by people attending a physical place (the university). The campus (which originates from Latin for “flat land, field” (Campus, 2019)) and its buildings are important. The students received information from a member of the academic staff, usually supplied in the form of a lecture with handouts and textbooks (Gilly, 2017; Keats & Schmidt, 2007). This period is characterised by **centuries of experience with memorisation**, based on teacher and student interaction via dictation (Diwan, 2017); it was a one-way process, with students largely the consumers of information (Gilly, 2017). This period helped to increase the role of women in industrial and academic fields. We have to stress that it is difficult to determine the extent to which the changes in society and education following these industrial revolutions result from these revolutions or from other changes related to different economic and geopolitical shifts and wars. We believe that the higher education system could be a part of industry and is in need of an industrial revolution.

The Third IR is attributed to computerisation, digitisation and web-based interconnectivity. Access to higher education increased, and globalisation accelerated this process even more. Mass education has spread. It is distinguished by **Internet-enabled learning** (Diwan, 2017). The technologies of Web 2.0 are used to enhance traditional approaches to education by means of blogs, podcasts, social bookmarking, wikis, video-sharing sites and related participation technologies, all still within the framework of Education 1.0 (Gilly, 2017; Keats & Schmidt, 2007). This means having socially constructed facilities, usually with the aid of Internet access, involving both teacher-to-student and student-to-student interaction. Internet resources are a normal part of learning activities (Diwan, 2017). The nature of students and their expectations therefore started to shift (Gilly, 2017). An example of this period is the “flipped classroom”. This means an arrangement where students are introduced to content at home and then practise working through it at school (The Definition Of The Flipped Classroom, 2016). **Consuming and producing knowledge** is a key feature of this period

(Diwan, 2017). In this period, online education made great strides with different online courses, options and platforms – we can mention MOOC, Moodle, Edmodo and others that are in operation. This revolution offers educators and students an environment with immediate and free access to information.

The Fourth IR is the time of **Education 4.0 empowering education to produce innovation** (Diwan, 2017) with the utilisation of artificial intelligence and bio- and nanotechnologies. The most important technology is the great expansion in computer power and storage, known as “Moore’s Law” (Anders, 2014). According to a 2015 survey report, over 816 executives and experts determined a number of tipping points marked by particular achievements, as follows: implantable mobile phones by 2025 (82%), 80% of people with a “digital presence” by 2023, 10% of reading glasses connected to the Internet by 2023, 10% of people wearing Internet-connected clothes by 2022, 90% of the world’s population with access to the Internet by 2024, 90% of the population using smartphones by 2023, 1 trillion sensors connected to the Internet by 2022, over 50% of Internet traffic directed to homes and appliances by 2024, driverless cars making up 10% of all cars in the US by 2026, as well as many other outcomes, such as AI members on boards of directors, AI auditors and robotic pharmacists, a proliferation of bitcoin in the economy, 3D printed cars by 2022, transplants of 3D printed organs such as livers by 2024, and several others (WEF, 2015). The Internet of Things (IoT) enables technologies of nearly anything imaginable. The exact impact of Fourth IR technologies on our society and environment is not yet quite clear, but higher education must respond urgently to find the positive impacts on society and on environmental issues. Diwan (2017) further highlights the 5 “I”s of learning in education as follows: **IMBIBING**: internalising basic concepts; **ITERATING**: practising fundamental skills rigorously; **INTERPRETING**: taking facts from the studies and then adapting and applying them to different situations; **INTEREST**: developing enough curiosity about a subject so as to delve deeper into it and create a further body of knowledge; and **INNOVATING**: thinking differently and coming up with original concepts for building innovative ideas, products and services.

5 The future of AI in education

Artificial intelligence is resonating in our world these days. Alexa, Siri, Cortana and others manage our tasks and calendars or operate smart homes. Facebook shows us our friends, we communicate with followers by means of tweets, and we post photos to share with friends on Instagram. Computers, the Internet and AI rule our society. Voice commands on phone require AI, Google Translate uses AI, Facebook image tagging uses AI, and there are many other examples of reliance on modern technology. We have self-driving cars and buses, and air traffic control is almost fully automated. Automation and robots are on the increase (Tilley, 2017).

Modern technological advances such as Cloud computing (we explain this as the delivery of hosted services over the Internet), Big Data, telepresence robotics and others transform our lives. This era makes it possible for us to invent new, undreamed-of products and to produce them in new, undreamed-of ways, e.g. cellular devices, iPads, iPods, computers and tablets. The implementation of technology in higher education is the key to future education. Teachers of the 21st century should adjust to the technological revolution and also prepare students for the real world of technology.

Navracsics (Conference, 2016) stresses that “through new technologies, universities can now reach people who have not traditionally accessed higher education.” He adds that “digital technologies are changing how universities teach, how they do research and how they interact with each other and the outside world.” Massive Open Online Courses, Moodle, Edmodo and other online platforms open up higher education to students anywhere in the world and at any time.

We observe that the education sector is lagging behind. However, we believe that AI holds great promise for education. The field of artificial intelligence in education (AIEd) investigates learning wherever it occurs, in traditional classrooms or in workplaces, in order to support formal education as well as lifelong learning. It brings together AI, which is itself interdisciplinary, and the learning sciences (education, psychology, neuroscience, linguistics, sociology and anthropology) to promote the development of adaptive learning environments and other AIEd tools that are flexible, inclusive, personalised, engaging and effective (Luckin et al., 2016). At the heart of AIEd is the scientific goal to “make computationally precise and explicit forms of educational, psychological and social knowledge which are often left implicit” (Self, 1998). We are of the opinion that a revolution is needed, and this revolution could be the utilisation of AI in education.

Woolf et al. (2013) propose some “grand challenges” that AI in education should work to address, including: 1) mentors for every learner (omnipresent support that integrates user modelling, social simulation and knowledge representation); 2) learning 21st century skills (assist learners with self-direction, self-assessment, teamwork and more); 3) interaction data to support learning (bring together the vast amounts of data about individual learning, social contexts, learning contexts and personal interests); 4) universal access to global classrooms (increase the linking and accessibility of classrooms globally); and 5) lifelong and lifewide learning (taking learning outside the classroom and into the learner’s life outside the school).

In technologies, there have been major strides to help teachers currently teaching in traditional models. In 2016, Ashok Goel used an AI program called Jill as a teaching assistant (Lipko, 2016). The program replied to student email queries regarding assignments. Jill had a confidence level of 97%. Virtual teaching assistants saved faculty time and increased student participation (Maderer, 2017).

In general, human beings are worried that robots will replace human workers. Research by Gartner (2017) predicts that AI may actually create more jobs than it is expected to eliminate. Will AI replace teachers completely? Those professions that help other people, give advice and invent new ideas, such as teachers, nurses and IT analysts, have an absolutely low probability of being substituted by robots (1%) (Globsk, 2018). Luckin et al. (2016) add “crucially we do not see a future in which AIEd replaces teachers. What we do see is a future in which the role of the teacher continues to evolve and is eventually transformed; one where their time is used more effectively and efficiently, and where their expertise is better deployed, leveraged, and augmented.”

Conclusions

The industrial revolutions represent periods of great imagination and progress, and this is still on the increase. The IR was an outburst of modern inventions globally; many of the tools from this period are still used today.

Every country's education system differs. In the 1800s, formal education became available even to the poorest. Before this, education was not free and only for the privileged. Since the early 19th century, this process, stretching from the pre-Industrial Age to the Industrial Age, has created a radically modern articulation of the education system. The education model of 19th and early 20th centuries was built by professionals, merchants, office workers and physical labourers. In the 21st century, we need a minority of unqualified workers, but more hard-working, self-educated workers and workers who can use their own initiative. Consequently, we discussed history with the aim of understanding the future. To project the expected transformation of higher education in terms of the industrial revolutions, one can use the generation model of higher education, which generally suggests that a generation emerges, develops and then gives way to the next generation, as presented in our paper. Overall, we have indicated the evolution of mankind's teaching systems from the first steps of Education 1.0, through 2.0 and 3.0, and up to Education 4.0. We highlight that a common feature of education systems is the balance between tradition on the one hand and the implications of flexibility and adapting current trends in our society on the other.

The latest revolution (transformation toward the knowledge society), the modern form of a higher education, is emerging through the worker's ability to perform various primary activities in different ways. These organisations of higher education are interdisciplinary, collaborative and have virtual classrooms, laboratories and students; access to libraries and teachers is available anywhere and at any time. We believe that this does not detract from the education experience, but in fact augments it. This process causes fundamental changes to the way we communicate, to our cognition, memory and identity.

We conclude that the emerging knowledge society appears to need more cooperation between industries and the education sector. Sir Anthony Seldon stresses "that there is a profound mismatch between the way we are educating our young and the world we're educating them for, and what should, and could, be happening" (Swift, 2018).

Seldon & Abidoye (2018) emphasise that "AI could transform schools, enabling education to be personalised to each pupil, removing the need for exams and allowing every child in the country, whether they're at a top public school or an almost failing state school, access to the same technology. It will be technology that is driving the teaching." Ultimately, the true goal of artificial intelligence in education can be seen to be the combining of the best of human beings and of machines for the benefit of the teacher and the student. Dodgson & Gann (2017) further conclude that "AI can augment and empower what universities already do ... requiring fundamental reassessment and transformation." The ethics of using AI in education, however, is an important question that requires profound consideration.

Overall, it may be said that Industrial Revolution 4.0 represents a fundamental change in the way we live, work and relate to one another (WEF, 2019). These advances create modern professions (Labour 4.0), which demand workers with a modern flexible way of thinking, and this is a need that can be solved with Education 4.0 anywhere and at any time. To sum up, we are of the opinion that higher education must progress from educating to job training.

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