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## Correspondence and questions

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# Editorial

The mission of the *IJISPM - International Journal of Information Systems and Project Management* is the dissemination of new scientific knowledge on information systems management and project management, encouraging further progress in theory and practice.

It is our great pleasure to bring you the first number of the fifth volume of IJISPM. In this issue readers will find important contributions on Enterprise Collaboration Systems, offshore outsourcing practices, Lean IT implementations and digitalization challenges.

The first article, "Enterprise collaboration systems: addressing adoption challenges and the shaping of sociotechnical systems", is authored by Clara S. Greeven and Susan P. Williams. It examines the adoption challenges organizations encounter when they introduce Enterprise Collaboration Systems (ECS) and the measures that can be used, i.e. actions that can be taken, to address these challenges. The aim of the article is to provide an overview of the multitude of different ECS adoption challenges and measures, and based on these, to lay the theoretical and analytical basis for studying the shaping of such complex sociotechnical systems. For this purpose, a qualitative meta-analysis of the academic literature and interviews with companies were conducted, which resulted in a collection of ECS challenges and measures classified and analyzed with regard to their specific spatiotemporal aspects. Drawing on the results of this study, research imperatives, which include the call for studying ECS over multiple time frames and settings, are presented.

As Anne-Maarit Majanoja, Linnéa Linko and Ville Leppänen state in the second article "Developing offshore outsourcing practices in a global selective outsourcing environment - the IT supplier's viewpoint", internal Information Technologies (IT) organizations are using outsourcing and offshore arrangements to achieve cost savings and gain access to new capabilities. Suppliers' personnel at the operational level can face challenges with internalizing their operations based on the agreed outsourcing practices and transferred responsibilities. This study gives voice to the supplier and studies the impact of offshore outsourcing operation development activities. The internal IT unit from Nokia Devices selectively outsourced global IT service activities and responsibilities to the IT supplier. The outsourced activities were implemented by offshore centers in India and China. It was found that the global selective outsourcing environment (GSOE) did not provide a solution to all of their expectations, and new unexpected challenges occurred. Several practices, communication and information sharing, and behavior-related lessons learned items were identified. It was found that the GSOE operation needs to be developed and implemented in an agile and incremental manner, instead of a singular implementation approach. Also, the globally distributed teams' group dynamics critically impacted on the teams' ability to work. The lessons learned items and recommendations can be utilized by other companies during their mode-of-operation development.

The third article "Change management lessons learned for Lean IT implementations" is authored by Jörn Kobus, Markus Westner and Susanne Strahringer. Lean Management is a standard production mode that has been familiar to production organizations for several decades. To date, however, academic literature has presented surprisingly little information about the application of Lean Management in IT organizations, or what is called Lean IT. Drawing upon an empirical qualitative case study of the IT departments of two multinational companies, in this paper the authors identify change management lessons learned for Lean IT implementations, as well as seven characteristics of a corresponding change management approach.

As Päivi Parviainen, Maarit Tihinen, Jukka Kääriäinena and Susanna Teppola state in the fourth article "Tackling the digitalization challenge: how to benefit from digitalization in practice", digitalization has been identified as one of the major trends changing society and business. This paper discusses digitalization and presents a digital transformation

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model, explaining a starting point for a systematic approach to tackle digital transformation. The model consists of four main steps, starting with positioning the company in digitalization and defining goals for the company, and then analyzing the company's current state with respect to digitalization goals. Next, a roadmap for reaching the goals is defined and implemented in the company. These steps are iterative and can be repeated several times. Although company situations vary, these steps will help to systematically approach digitalization and to take the steps necessary to benefit from it.

We would like to take this opportunity to express our gratitude to the distinguished members of the Editorial Board, for their commitment and for sharing their knowledge and experience in supporting the IJISPM.

Finally, we would like to express our gratitude to all the authors who submitted their work, for their insightful visions and valuable contributions.

We hope that you, the readers, find the International Journal of Information Systems and Project Management an interesting and valuable source of information for your continued work.

The Editor-in-Chief,

João Varajão

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João Varajão is currently professor of information systems and project management at the *University of Minho*. He is also a researcher of the *Centro Algoritmi* at the *University of Minho*. Born and raised in Portugal, he attended the *University of Minho*, earning his Undergraduate (1995), Masters (1997) and Doctorate (2003) degrees in Technologies and Information Systems. In 2012, he received his Habilitation degree from the *University of Trás-os-Montes e Alto Douro*. His current main research interests are in Information Systems Management and Information Systems Project Management. Before joining academia, he worked as an IT/IS consultant, project manager, information systems analyst and software developer, for private companies and public institutions. He has supervised more than 80 Masters and Doctoral dissertations in the Information Systems field. He has published over 300 works, including refereed publications, authored books, edited books, as well as book chapters and communications at international conferences. He serves as editor-in-chief, associate editor and member of the editorial board for international journals and has served in numerous committees of international conferences and workshops. He is co-founder of CENTERIS – Conference on ENTERprise Information Systems and of ProjMAN – International Conference on Project MANagement.

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# Enterprise collaboration systems: addressing adoption challenges and the shaping of sociotechnical systems

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# Enterprise collaboration systems: addressing adoption challenges and the shaping of sociotechnical systems

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**Abstract:**
This article examines the adoption challenges organizations encounter when they introduce enterprise collaboration systems (ECS) and the measures that can be used, i.e. actions that can be taken, to address these challenges. The aim of the article is to provide an overview of the multitude of different ECS adoption challenges and measures, and based on these, to lay the theoretical and analytical basis for studying the shaping of such complex sociotechnical systems. For this purpose, a qualitative meta-analysis of the academic literature and interviews with companies were conducted, which resulted in a collection of ECS challenges and measures classified and analyzed with regard to their specific spatiotemporal aspects. Drawing on the results of this study, research imperatives, which include the call for studying ECS over multiple time frames and settings, are presented. These will be examined in greater depth as part of our wider, multidisciplinary research program that focuses on enterprise collaboration systems use in the emerging digital workplace.

**Keywords:**
Enterprise Collaboration System (ECS); Enterprise Social Software (ESS); sociotechnical systems; CSCW; adoption.

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## 1. Introduction

This article links to the findings presented in our previous publication on identifying the adoption challenges of enterprise collaboration systems [1]. In this article, we extend that work to show not only the challenges that organizations encounter during the introduction of an enterprise collaboration system (ECS) but also the measures that can be used, i.e. actions that can be taken, to address these challenges. ECS are software systems that combine enterprise social software (ESS) components (e.g. social profiles, tags, wikis, blogs) with traditional groupware components (e.g., e-mail, group calendars, document libraries) [2], [3] to support organizations specifically in internal business communication, collaboration, and content and knowledge sharing activities. Today, ECS are seen as an important enabler of the modern digital workplace [4]. Such "socially-enabled" collaboration systems have gained attention from both the scientific research community and practitioners, however there are still uncertainties regarding their successful adoption and appropriation [5]–[7]. One reason is that organizations often introduce an ECS to utilize its potential for organizational innovation [8], but due to its novelty have little experience from which they can draw. The ESS and ECS literatures have started to document both challenges organizations face when introducing ECS and measures to address these diverse ECS adoption challenges. However, the body of research literature examining the adoption of ECS and ESS is currently fragmented and provides few in-depth empirical cases. In addition, the nature of the challenges that occur as part of an ECS initiative are multifaceted in terms of space and time and thus often require different ways of addressing them.

The study presented in this article constitutes only one part of a wider and multidisciplinary research program which focuses on enterprise collaboration systems and the emerging digital workplace [9], [10]. This article aims, firstly, to provide an overview of the multitude of different ECS adoption challenges and measures to address them, and secondly, to lay the theoretical and analytical basis for studying such complex sociotechnical systems. While transactional business software, such as Enterprise Resource Planning (ERP) systems, are typically used on a mandatory basis and introduced with clearly defined usage scenarios within specific business contexts, ECS are usually used voluntarily and use may change as well as be shaped over time. As opposed to traditional business software ECS stands out due to the possibility to use ECS in a variety of different ways depending on the context in which it is used and the actors involved as well as the experiences collected over time [4]. As a consequence, space and time specific challenges might arise when organizations introduce ECS and the measures proposed in the body of ECS literature for successfully using ECS might not be universally valid. However, for organizations to be prepared for the challenges that might arise and to assess the possibilities for dealing with them, a preliminary overview of ECS adoption challenges and measures is needed.

Through an in-depth analysis and synthesis of the extant literature and triangulating company interviews, the research objectives to accomplish the aims outlined above, are to i) identify and classify the challenges that organizations experience during the process of ECS introduction and the measures that can be used by organizations to address these challenges, ii) illuminate the identified ECS adoption challenges and measures to provide examples that illustrate their spatiotemporal characteristics and impact on the ECS adoption process and iii) discuss issues of sociotechnical change that guide the further analysis of ECS adoption, appropriation, and use as part of this broader research program.

This article is organized as follows. In the next section, the emergence of socially-enabled ECS and associated adoption literature is outlined to provide a common understanding for this research endeavor. Section 3 shows the underlying research design of this study. The results are presented in section 4. In section 5, the results of this study are interpreted to derive research imperatives, and section 6 concludes the study with a short summary of the findings and future research.

## 2. The adoption of Enterprise of Collaboration Systems in the Literature

Globally, there are high levels of financial investment in information systems and technology (IS/IT) to adapt and support business (e.g., [11], [12]). Research on the value companies gain from IS/IT investments is extensive and has

been reported as an issue for over 25 years (e.g., [12]–[17]). The use of traditional enterprise software has now been complemented by ESS, confronting both researchers and practitioners with new adoption challenges that might impact the realization of benefits that contribute to IS/IT value. The successful use of ESS is seen as a crucial factor for the competitiveness of organizations.

Based on the immense success of social media, open platforms on the internet, as evidenced by the increasing number of users [18], the development of and demand for socially-enabled collaboration software in the workplace has gained momentum. Organizations have started to embrace the opportunities and challenges that come along with these enterprise collaboration systems that enhance traditional groupware with ESS. Attracted by new possibilities for content syndication, sharing user-generated content, socializing and networking, organizations expect to improve and extend their information sharing, communication, coordination and interaction capabilities [9]. The Computer Supported Cooperative Work (CSCW) research field has for some decades investigated how collaboration in work groups can be supported by means of traditional groupware [4], but the emergence of social software features, such as social profiles, wikis, blogs, microblogs, forums, or activity streams, as a supplement to traditional groupware has led to a shift from purpose-specific software to malleable software that is dependent on time and space, and therefore also on the employees working with it and their skills and experience [4], [8].

Meanwhile financial spending on ECS is significant and the ESS market is rapidly growing, forecasts predict up to $US6.18 billion expenditure in 2018 [9], with large software vendors like IBM, Microsoft or Atlassian dominating the market. Despite the significant interest in the use of social software behind company firewalls and the fact that ECS are increasingly being integrated into daily work, there is still considerable uncertainty regarding the best ways to gain business value from them [9]. This uncertainty is linked to a plethora of ECS adoption challenges and the fact that organizations often find themselves in a cultural change situation with regard to their ECS implementation.

A growing body of literature in the ESS and ECS research field draws attention to the potential of ECS for collaborative work and to the different ECS adoption challenges (e.g., [19]–[23]). This work is complemented by research on how to successfully introduce behind-the-firewall social software by means of appropriate adoption measures (e.g., [24]–[27]). Although a significant contribution has been made towards raising corporate awareness for a new form of business software, which is characterized by gradual diffusion and evolutionary business change, an overview of the challenges organizations can be confronted with when introducing ECS and the measures that can be used to address these challenges is missing. The sub-sets of ECS adoption challenges and measures raised and/or discussed in literature are often based on cross-sectional case studies conducted at a single point in time (e.g., [23], [25], [28]) which therefore downplay the characteristic that ECS evolve over multiple time frames and settings. Therefore, the implementation of proposed ECS introduction strategies typically incorporating a set of measures by a company may not necessarily lead to success. The study presented by Heinemann et al. [24] further shows that ECS adoption challenges, which can be linked to different stakeholder groups, can be addressed by appropriate actions and interventions at different stages in the adoption process. This can be explained by challenges occurring or being noticeable at different times. This is not surprising, since ECS are, due to their voluntary use, not adopted by all stakeholders all at once and ECS use purposes and patterns typically emerge through experimentation [8]. Different stakeholders have different capabilities in terms of skills, experiences and traits leading to individual adoption challenges. Likewise, ECS adoption measures might be applied by different stakeholders depending on their background. So-called champions are often named as a group of actors who are familiar with the use of social software to support daily work practices and who are supposed to promote this new type of working among the other employees [19]. By contrast, employees who stick to traditions and old work practices are more likely to be resistant to ECS-triggered change [29]. In order to gain value from ECS organizations need to flexibly react to ECS adoption challenges that emerge over time and space. This article does not aim to propose a generally valid solution to successful ECS adoption but to illustrate the diverse nature of ECS adoption challenges and measures and, building on this, to lay the foundation for studying the evolution of ECS considered as complex sociotechnical systems.

## 3. Research Design

This study examines the ECS adoption *challenges* that organizations face when introducing enterprise collaboration systems (ECS) and the *measures* that can be used, i.e. actions that can be taken, to address these challenges. For this purpose, an iterative, interpretive and qualitative research approach with a qualitative meta-analysis method is applied by which key challenges and measures are identified, aggregated, and categorized. The goal is to consolidate prior research to provide a more complete and comprehensive overview than any of the original, individual studies dealing with the successful adoption of ECS. At the same time, the research seeks to reveal the multifacetedness of ECS adoption challenges and measures in terms of space and time. Based on this and the specific nature of ECS as complex and evolving sociotechnical systems that incorporate human and non-human actors, suggestions for analyzing ECS initiatives are derived. As input data two main sources are used: i) the academic literature on ESS/ECS and ii) company interviews as a means to triangulate and, if necessary, to extend the findings drawn from the literature. This study is structured into three research phases as shown in Fig. 1.

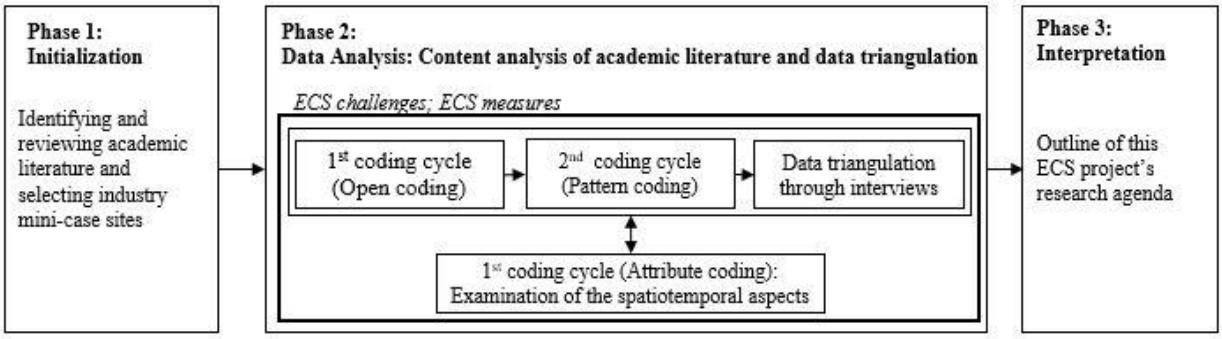


Figure 1. Research steps

*Phase 1: Initialization* includes an extensive search and analysis of the academic literature on enterprise collaboration systems. By adopting the approach of Huff [30], a broad search of the topic of ECS was carried out first, since it was expected that ECS challenges and measures could be identified from all fields of study. As social software has been subject to both technological development and changing conceptions with regard to its potential, different terms used in the academic literature were taken into account, in order to avoid excluding findings that equally apply to socially-enabled ECS. Literature databases including ACM Digital Library, Emerald Insight, SpringerLink, IEEE Xplore Digital Library, ScienceDirect, and Google Scholar were searched using the search terms "social software", "e-collaboration", "web 2.0", "enterprise 2.0", "social business", "collaborative software", "enterprise social software", "enterprise collaboration system", "adoption", etc. and combinations of them to start with a corpus of primary articles. To identify additional relevant articles from the reference lists of the primary articles, snowballing as a search method was then applied. The literature search was supplemented with a search for suitable companies for the elaborating company mini-cases and interviews were arranged in order to collect data for triangulation. A prerequisite for conducting the interviews was that the selected companies had not only introduced an ECS but were also willing to speak openly about the adoption challenges they had experienced and the measures applied to address them. Two hi-tech companies who had adopted ECS were selected for the study. Technology savvy companies are more likely to have implemented social software. Since the focus of this research is on the exploration of ECS challenges and measures, the restriction to technology companies is regarded as appropriate. In order to structure the planned interviews, an interview guideline was developed which introduced the interviewees to the topic, and used open and closed questions to investigate their ECS adoption challenges and measures.

*Phase 2: Data Analysis* comprises a qualitative in-depth content analysis of the academic literature to identify and categorize both ECS adoption challenges and measures. For this, two cycles of literature analysis and coding to classify the ECS adoption challenges are conducted and then triangulated with the data collected from the interviews in the two selected German case study companies. While the empirical cases in literature often cover large enterprises and SMEs (e.g., [21], [24]), the selected companies comprise less than 15 employees each and have a flat hierarchy to allow fast decision making. Upon approval by the companies the interviews were recorded and transcribed before using the data to refine the classification and capture any additional challenge and/or measure. The identified ECS adoption challenges and measures are then examined by using another coding cycle to understand their spatiotemporal nature in terms of timing and actors involved as well as the impact of the challenges on the ECS adoption process. For illustration purposes, the specific characteristics of selected ECS adoption challenges and measures are captured exemplarily.

*Phase 3: Interpretation* is used to reflect on the identified challenges and measures and, based on that, to propose a research agenda for this wider and multidisciplinary research program. The focus is on the theoretical and analytical implications of the spatiotemporal facets of ECS projects for the future analysis of such projects.

## 4. Data Analysis and Findings

Based on the research design selected it was possible to identify and categorize both ECS adoption challenges and measures through an in-depth content analysis and triangulating interview data. Furthermore, the spatiotemporal characteristics of challenges and measures could be examined and examples provided accordingly.

### *4.1 Identified and categorized ECS adoption challenges and measures*

The aim of the first coding cycle is to generate two preliminary code tables, one containing the adoption challenges and the other containing the adoption measures identified from the literature. Following the open coding approach proposed by Miles and Huberman [31] and Saldaña [32], each selected article was carefully read, analyzed and coded. The first coding cycle with several coding iterations resulted in one code catalogue with 29 distinctive codes of ECS adoption challenges and another code catalogue with 39 distinctive codes of ECS adoption measures. Based on these open codes a second coding cycle applying pattern coding [31], [32] was initiated to iteratively develop meaningful categories and sub-categories of the identified challenges and measures. For this purpose, similar codes were grouped together and thematic codes developed. Five adoption challenge areas were identified, namely *culture*, *business/operation*, *technology in use*, *benefits*, and *attitude/behavior* each to which a group of challenge types and sub-types were assigned. Likewise, five adoption measure areas were identified, that is to say *preparation*, *guidance*, *optimization*, *influence*, and *prerequisite* each of which comprises also a group of measure types and sub-types.

Two technology startup companies that had introduced an ECS, MS SharePoint (Company A) and Atlassian Confluence (Company B), respectively, were willing to speak openly about their experience with the ECS adoption in semi-structured face-to-face interviews with a length of about 60 minutes each. One key user of Company A and one key user as well as the CEO of Company B were available for an interview. The data collected in these interviews in 2015 were recorded, transcribed and used to confirm and cross-reference the codes identified from the literature analysis as shown in Fig. 2. All codes were hierarchically structured to represent groups of challenges and measures and their order from general to particular.

The descriptions of all challenge codes can be found in our previous publication [1] in which we limited our analysis and discussion to understanding ECS adoption challenges. Building on our previous work and the new insights gained the challenge areas and the adoption measure areas (metacategories) can be described as follows (Table 2).

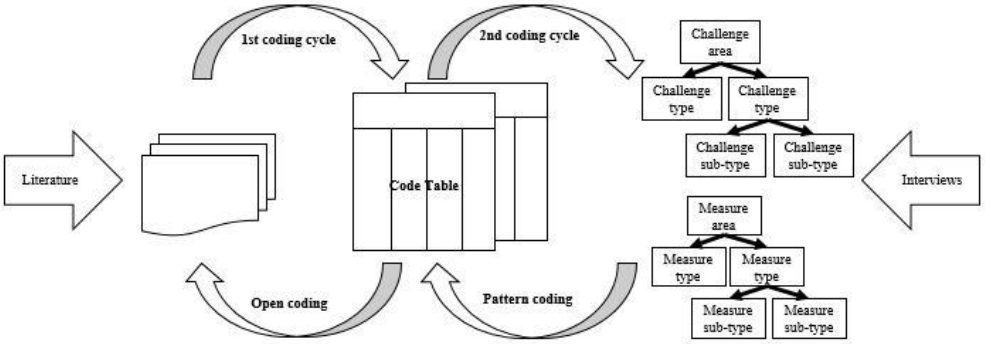


Figure 2. Coding process

Table 1. Challenge areas (adapted from [1])

| **Challenge area** | **Description** |
|---|---|
| Culture | Challenges of this type are organizational challenges that can be traced back to the corporate culture being shaped by management behavior and attitudes as well as the cultural values and norms that exist within the company |
| Business/Operation | Challenges of this area can be attributed to both ineffective and inefficient uses due to operating without clear and suitable specifications/ objectives regarding the ECS project, as well as missing or poor general work management. |
| Technology in Use | Challenges of this area deal with the handling and management of work and working with the ECS technology itself. This includes personal adoption hurdles due to, for instance, lack of awareness and knowledge about the newly introduced ECS, poor quantity, quality and organization of the ECS content and information management processes, as well as poor integration of the ECS into the IT and work environment. |
| Benefits | Challenges of this type address the questionable benefits of using an ECS, with perceived disadvantages outweighing the perceived advantages of it. As an example, users might perceive a disproportionally high workload required for using the ECS. |
| Attitude/ Behavior | In contrast to the challenge area Culture, the challenge area Attitude/ Behavior addresses individual and not organizational level challenges. Employees may show inflexibility regarding the use of a new system, may not properly collaborate within the system for various individual characteristics and attitudes, or give only little priority to ECS use. |

Table 2. Measure areas

| **Measure area** | **Description** |
|---|---|
| Preparation | Measures of this type refer to the preparation in terms of both technical and human aspects. By seeding content in the system, for instance, employees might be attracted to using the ECS and its content. Thus, considering the current corporate and cultural situation and clarifying where the ECS journey shall be headed might help in designing the ECS project. |
| Guidance | Measures of this area aim to guide the employees in using the ECS. For this purpose, training, guidelines/ policies, or support might be considered suitable. |
| Optimization | Measures of this type aim to enhance and monitor the quality of ECS content and user performance. |
| Influence | Measures of this type address the employees' perceptions about the introduced ECS and their usage behavior. Stimulating self-motivation, providing gratification or the communication of individual benefits when using ECS might lead to success. |
| Prerequisite | Measures of this type aim to facilitate system adoption and use by establishing an environment that favors an enterprise collaboration culture. This could be achieved by valuing openness or establishing management commitment, for instance. |

As stated, both challenge areas and measure areas include groups and sub-groups of challenges and measures, respectively. Four additional challenge codes were identified from the company interview transcripts; these were not found as part of the in-depth literature analysis. Three were added to the hierarchical collection of challenge codes and one to the hierarchical collection of measure codes already identified and categorized from literature. The new challenge codes are *Insufficient understanding of relevance*, *Overload*, and *Growing complexity*, as depicted in Table 1 showing the identified and categorized challenges. The new measure code is *Access control*, as can be taken from Table 2 showing the identified and categorized measures. All new codes are labelled with an asterisk (*) in the Tables 3 and 4. Although it is not the aim of this research to compare different ECS initiatives, it is assumed that challenges such as *Overload*, referring to employees being overwhelmed with work so they forget about using the ECS, are typical of startup companies which have often limited resources and the time to market as a primary driver of development [33].

The interviews revealed that the challenges both case companies had encountered during the introduction and use of the ECS partially overlap. Both companies only experienced a sub-set of the challenges identified from literature with *Low support*, *Lack of specific project goals*, *Lack of activity*, *Low quality*, *High effort* being perceived as particularly detrimental to ECS adoption. The company that had introduced MS SharePoint (Company A) additionally perceived *Missing alignment of structures*, *Low ECS skills, knowledge, and experiences*, and *Poor management of multiple tool/system usage* as highly challenging. The company that had introduced Atlassian Confluence (Company B) also classed *High time exposure*, *Productivity killer* as well as *Insufficient understanding of relevance*, *Overload*, and *Growing complexity* with the challenges of greatest concern. Interestingly, there was sometimes a mismatch between the perceived challenges of the Chief Executive Officer (CEO) and the key user, which shows that different actors may have different views of the ECS that was introduced and used in the respective company. While for instance, *Lack of processes* was mentioned by the key user of Company B as a perceived challenge, the CEO of this company did not perceive this challenge at all. Accordingly, the perceived need for taking action by means of appropriate measures to address ECS adoption challenges was dependent on the individual interviewee. Therefore, it is recommended that companies consider multiple views for successful ECS adoption as the diffusion of social software within the company is substantially linked to different groups of current and potential users [55]. Both companies applied some of the measures coded from the analyzed literature but not to intentionally address specific ECS adoption challenges. Among others, *Training the practical application of social features*, *Rules of conduct*, *Creation of personal profiles*, *Open communication*, *Inclusion of all employees from the beginning*, and *Minimizing mistrusting practices* were used. Although these measures were not used deliberately, the interviewees took the view that by applying these measures some challenges could have been prevented. One employee said:

> *"Yeah, all the problems like 'Poor anonymity' or 'Sense of missing rewards' are not fulfilled because mistrust is minimized […] This all arises out of our corporate culture which is very open and informal." (Employee, Company B)*

It is also important to note that each organization having introduced an ECS might use a different approach to managing ECS adoption challenges. While, for instance some organizations might reject the use of gamification measures, such as *Awarding a specific status* to employees for their contribution efforts publicly in the ECS, others might consider such measures particularly useful. Depending on the network of actors and the context in which the ECS is embedded, gamification measures might foster a competitive situation unpleasant for the users [53] or meet the need for rewards and thereby support system adoption [24]. Similarly, there is debate about whether the use of *Financial incentives* [24] or too much *Guidance* is conducive to the adoption of corporate social software [42]. The introduction of ECS is further complicated by the fact that organizations can encounter and be unprepared for ECS adoption challenges at different stages in the adoption process. When Company A introduced MS SharePoint the employees were initially very motivated to use it. The management also supported the employees to help them use the system and the usage rate was initially high. Over time, however, the challenge *Missing alignment of structures*, which refers to the mismatch between the organizational structure and the social software approach, led to a gradual decrease in usage. Through the development of the classification of adoption challenges it was confirmed that challenges occur at different points in time and to different stakeholder groups. The following section deals with the spatiotemporal aspects of challenges and the related measures to address these challenges.

Table 3. Classification of ECS adoption challenges

| Challenge Area | Type of challenge | Sub-type of challenge |
|---|---|---|
| Culture | Missing commitment from the executives | Low acceptance [19], [24], [26], [34] |
| | | Low support [29], [34] |
| | | Insufficient understanding of relevance* |
| | Values and norms impeding change | Ingrained processes [20], [21] |
| | | Resistance to changes [26], [35], [29], [36] |
| Business/Operation | Inappropriate project goals [34] | |
| | Lack of specific project goals [21], [35] | |
| | Missing alignment of structures [20], [22], [24], [29], [37] | |
| | Lack of processes [24], [26], [35], [38] | |
| | Overload* | |
| Technology in use | Inefficient content | Lack of activity [24], [25], [39], [40] |
| | | Low quality [22], [23], [39] |
| | Lack of competence | Uncertainties about social SW usage [19], [24] |
| | | Low ECS skills, knowledge, and experiences [20], [21], [23], [24] |
| | System inefficiencies | Poor management of multiple tool/system usage [27] |
| | | Low awareness about the system's existence [29], [41] |
| | | Growing complexity* |
| | Misuse of time and computing resources [26] | |
| Benefits | Perceived costs | High time exposure [20], [23], [26], [29] |
| | | High effort [21], [23], [42] |
| | | Productivity killer [23], [43] |
| | Perceived lack of protection | Privacy concerns [21], [39] |
| | | Poor anonymity [23], [28] |
| | Sense of missing rewards [22] | |
| | Sense of loss of power [22], [24] | |
| Attitude/Behavior | Inflexibility | Reliance on other systems [21] |
| | | Reluctance to learn another system [20], [21] |
| | Ineffective collaboration processes | Reluctance to modify other's content [21], [44] |
| | | Low self-confidence [24] |
| | | Avoidance of other's content and knowledge [24], [34] |
| | | Employees underperforming [24] |
| | Little priority of collaboration [20], [21] | |

Table 4. Classification of ECS adoption measures

| Measure Area | Type of measure | Sub-type of measure |
|---|---|---|
| Preparation | Target-actual comparison | Analysis of employees' readiness and willingness for change [26], [34] |
| | | Clarification of user expectations [2], [24] |
| | | Business assessment [20], [45] |
| | | Identification of CSFs and definition of performance measures [25], [26] |
| | | Training needs analysis [46] |
| | System preparation | Seeding of content as a foundation [23], [25], [40] |
| Guidance | Training | Teaching the concept of ECS [19], [24] |
| | | Training the practical application of social features [19], [24] |
| | | Training about key use cases and collaboration scenarios [24], [27], [34], [47], [48] |
| | Guidelines/ Policies | Guidance on the structure of the social software tools [23] |
| | | Guidance of the categorization of content [23], [24], [46] |
| | | Rules of conduct [23], [26], [49] |
| | | Policies for security and privacy protection [26] |
| | Support [23], [25] | |
| Optimization | Intervening | Implemented processes for reducing redundant information [21] |
| | | Implemented procedure for misuse of time and computing resources [24], [26], [21] |
| | | Access control* |
| | Monitoring | Usage of performance measures [26] |
| Influence | Marketing | Propagation of the new way of working [19], [24] |
| | | Communication of target groups [23] |
| | | Communication of overall business goals [19], [23], [50] |
| | | Communication of set short-term goals and achievable short-term wins [24] |
| | | Propagation of benefits [24]–[26], [34], [41] |
| | | Development and marketing of an ECS brand name [51] |
| | Stimulating self-motivation | Discovering enjoyment [52], [53] |
| | | Creation of personal profiles [24], [25] |
| | Providing gratification | Awarding a specific status [24] |
| | | Usage of gamification elements assessing one's individual behavior (only for private viewing) [53] |
| | | Usage of feedback mechanisms for reused content [23] |
| | | Financial incentives [19], [24] |
| Prerequisite | Valuing openness, sharing, transparency | Involving all stakeholders [24], [34], [54] |
| | | Establishing a balance between anonymity and individual accountability [50] |
| | | Privileging open communication [23], [26], [50] |
| | Management commitment | Strong involvement and support from the top management [23], [41], [28] |
| | | Visible executive sponsorship/endorsement [19], [23], [48] |
| | Procuring confidence | Inclusion of all employees from the beginning [34] |
| | | Actively addressing employees' fears and social concerns [22], [41] |
| | Trust | Minimizing mistrusting practices [50] |

### *4.2 Spatiotemporal characteristics of ECS adoption challenges and measures*

Based on the descriptions of the identified codes it was possible to further analyze the adoption challenges to understand their spatiotemporal characteristics and impact on the ECS adoption process. For this purpose, the code descriptions were thoroughly read and another first coding cycle using attribute coding including In Vivo coding [32] was initiated allowing to capture essential characteristics of the challenges. After some iterations the following attribute codes and descriptors emerged:

- AFFECTING ENTITY: MANAGEMENT
- AFFECTING ENTITY: ORGANIZATION
- AFFECTING ENTITY: EMPLOYEES
- AFFECTED ENTITY: PIONEERS
- AFFECTED ENTITY: FIRST FOLLOWERS
- AFFECTED ENTITY: SECOND FOLLOWERS
- TIMING: PRE-INTRODUCTION PHASE
- TIMING: INTRODUCTION PHASE
- TIMING: POST-INTRODUCTION PHASE
- IMPACT: WITHHOLDS FROM USAGE
- IMPACT: AFFECTS EFFECTIVENESS OF USAGE

Both entity groups accountable for the identified challenges (*affecting entity*) and entity groups affected by the identified challenges (*affected entity*) were found. The descriptors *management*, *organization*, and *employees* were gathered for the affecting entity. Since the adoption of the ECS is meant to take place among the organization and its actors who can influence its diffusion [55], the affected entity is differentiated into distinctive adoption profiles with each representing one or two adopter categories proposed by Rogers [56]. Rogers suggests five adopter categories, namely innovators, early adopters, early majority, late majority, and laggards, to classify the individual or other unit of adoption into groups of actors with different sets of personality traits. To simplify the assignment of the identified ECS challenges to certain adoption profiles, the categories proposed by Rogers are clustered and renamed accordingly. Innovators and early adopters are represented by *pioneers*, early majority by *first followers*, and late majority and laggards by *second followers*. These descriptors also avoid the term laggards which is sometimes considered a negative label, since this adopter group has no strong pro-innovation bias [56]. Although it is assumed that the time at which an ECS adoption challenge occurs can be different from organization to organization, three time phases are coded to offer some orientation and show that challenges are not time-independent: *pre-introduction phase*, *introduction phase*, *post-introduction phase*. In addition, two primary types of impact that challenges have on the ECS adoption process were identified: *obstructs usage* and *affects effectiveness of usage*. Table 5 shows examples of the identified ECS adoption challenges and their spatiotemporal characteristics in terms of actors, timing, and impact type.

The challenge *Low support*, in which the management does not encourage the employees to use the ECS, might particularly obstruct usage. This can especially impact those with a relatively long innovation-decision period (first followers) when the system has not yet been fully integrated into daily work (introduction phase).

The challenge *Resistance to changes*, describing the low willingness to embrace the ECS due to fear of cultural change, is likely to impact those that are highly skeptical and traditional (second followers) and thus avoid using the system (obstructs usage). This challenge best fits the introduction phase when the cultural change process has not yet been completed and might be particularly the case in organizations where there is a general rejection of change.

The challenge *Lack of specific project goals*, referring to the situation in which the management has either not defined or communicated specific goals of the ECS project, particularly might lead to low motivation to use the just introduced system (introduction phase; obstructs usage). Once the users of the system have developed use cases and experienced

personal benefits from ECS use, this challenge might not be as serious as it had been. Therefore, this challenge might not so much negatively affect second followers but pioneers who are the first to adopt the ECS and first followers who adopt it just before the average employee of the company.

The challenge *Low quality*, which refers to content that is subject to immense uncontrolled growth, can only arise when the system is already introduced and used (post-introduction phase) by the employees. Low quality content that cannot be reused or does not add value might particularly affect the effectiveness of usage.

Table 5. Spatiotemporal aspects of exemplary ECS adoption challenges

| **Sub-type of challenge** | **Actors** | | **Timing** | **Impact** |
|---|---|---|---|---|
| | **Affecting entity** | **Affected entity** (adoption profile) | | |
| *Low support:* The management does not properly promote and encourage the employees to use the ECS. | management | first followers | introduction phase | obstructs usage |
| *Resistance to changes*: Low willingness to embrace the system in discussion due to fear of cultural change. | organization | second followers | introduction phase | obstructs usage |
| *Lack of specific project goals*: A lack of specific project goals may lead to the assumption that ECS use does not lead towards fulfilling goals, and thus possibly to low motivation. | management | pioneers; first followers | introduction phase | obstructs usage |
| *Low quality*: Content edited in a willful or destructive manner to include irrelevant information (vandalism) or content that is subject to immense, uncontrolled growth. As a result the content may not be reused, add value or employees may encounter problems in terms of navigation, orientation and search. | employees | non-specific | post-introduction phase | affects effectiveness of usage |

Just as challenges can occur at different times, ECS adoption measures can also be applied at different phases in the adoption process [24]. Through the identification and classification of measures it could be seen that measures can be preventive or counteractive in nature depending on whether they are applied before an organization encounters a certain challenge or after. This may also be linked to the approach an organization has taken. Who is implementing a certain challenge might or might not be prescribed, but depending on the nature of the measure different groups of actors with certain skills, experiences, and traits might be suitable. The measure codes were therefore also analyzed further to illustrate their diverse spatiotemporal characteristics. Again, the code descriptions were thoroughly read and attribute coding including In Vivo coding [32] was used to capture both the time a measure can be applied and its implementing entities. As for the challenges, the time periods *pre-introduction*, *introduction*, and *post-introduction phase* were considered suitable. For the implementing entity a variety of different actor groups (roles) were identified: *management*, *coaches/mentors/trainers*, *champions*, *employees*, *community/content managers*, *IT department*, *marketing*, *support agents/staff*, *community members*, and *initial project team*.

Thus, the following attribute codes and descriptors were assigned to the identified ECS adoption measures:

- TIMING: PRE-INTRODUCTION PHASE
- TIMING: INTRODUCTION PHASE
- TIMING: POST-INTRODUCTION PHASE
- IMPLEMENTING ENTITY: MANAGEMENT
- IMPLEMENTING ENTITY: COACHES/MENTORS/TRAINERS
- IMPLEMENTING ENTITY: CHAMPIONS
- IMPLEMENTING ENTITY: EMPLOYEES
- IMPLEMENTING ENTITY: COMMUNITY/CONTENT MANAGERS
- IMPLEMENTING ENTITY: IT DEPARTMENT
- IMPLEMENTING ENTITY: MARKETING
- IMPLEMENTING ENTITY: SUPPORT AGENTS/STAFF
- IMPLEMENTING ENTITY: COMMUNITY MEMBERS
- IMPLEMENTING ENTITY: INITIAL PROJECT TEAM

Table 4 shows examples of the identified ECS adoption measures and their spatiotemporal characteristics in terms of actors and timing.

Table 6. Spatiotemporal aspects of exemplary ECS adoption measures

| **Sub-type of measure** | **Actor: Implementing entity** | **Timing** |
|---|---|---|
| *Teaching the concept of ECS*:<br>Showing new ways of working and the potential of enterprise social software for day-to-day business. Teaching employees the concept of ECS may facilitate ECS adoption. | coaches/mentors/trainers, champions | introduction phase |
| *Development and marketing of an ECS brand name:*<br>The development and marketing of an ECS brand name to achieve name recognition and increase system awareness. | management, marketing, initial project team | pre-introduction phase, introduction phase |
| *Usage of feedback mechanisms for reused content*:<br>Usage of feedback mechanisms by which community members instantly receive feedback whenever other members use their contributions. | IT department | post-introduction phase |

The measure *Teaching the concept of ECS* is typically applied by trainers but can also be applied by champions who are known for stewarding the adoption process by encouraging others to use the social software based on their own experiences [19], [20]. This measure might be particularly important at the beginning of the ECS project (introduction phase) when the ECS is not yet widely used for daily work.

The measure *Development and marketing of an ECS brand name*, which is used to increase system awareness, can be implemented at any time. However, it may be most effective when having a brand name right from the start. Thus, it is sensible to already have developed the name before introduction and to market it alongside the system introduction.

The measure *Usage of feedback mechanisms for reused content*, where users receive feedback whenever other users make use of their contributions, is a technical task (e.g. through implementation of post tracking, automatic notifications and usage analytics) and therefore most suitable for the IT department as the implementing entity. By nature, it would make the most sense if the platform already has enough users (post-introduction phase) so that such mechanisms do not lead to demotivation in the case of little reused content.

It is important to note that the division of time into pre-introduction, introduction and post-introduction phase does not properly consider the speed with which the ECS is adopted or that different groups within the organization may be concurrently in different phases. However, it helps to show that organizations are likely to encounter different challenges at different times and that different measures might be implemented at different times. The following section builds on the gained insights into the spatiotemporal aspects of ECS challenges and measures and the specific nature of ECS as sociotechnical systems to discuss theoretical and analytical issues relevant for the research program's future studies on ECS adoption, appropriation, and use.

## 5. Interpretation

Traditional enterprise software like ERP systems or groupware can be described as purpose-specific end-user software developed and introduced to address an existing corporate problem. They are typically employed for clearly defined usage scenarios and within specific business contexts as well as often used on a mandatory basis usually after a set go-live date. This often requires a planned approach to managing change in a revolutionary context [8], [28]. In accordance with [8], [47], [57]–[61], enterprise collaboration systems are, unlike traditional enterprise software, often introduced ad-hoc to create potential and used on a voluntary basis. Since social software is particularly malleable and thus does not have prescribed forms of usage, companies are confronted with interpretive flexibility [62]. There are multiple interpretations with regard to how and for what purpose social software can be used. ECS can support a variety of work practices that may not follow a specific business purpose, and, therefore, can be part of the organization for any business process. The potentials of ECS are explored over time through use and the actual benefits emerge through experimentation and appropriation. Thereby, the form of usage, which evolves over time, depends on the context it is embedded in and that likewise is subject to change. Since ECS are designed through use, including experimenting with its capabilities, organizations cannot fully anticipate a priori the route of ECS use, the adoption challenges they will encounter and the benefits that will actually unfold. This means that they cannot easily plan for in advance how the system is to be used. Although benefits are expected [57] organizations often lack a clear vision of how to ensure benefits realization [9] which is considered to be due to diverse options for using ECS (multiple interpretations). This uncertainty is linked to a variety of ECS adoption challenges. The challenges *Insufficient understanding of relevance*, *Uncertainties about social SW usage*, or *Employees underperforming* are some examples to name but a few.

The analysis of ECS adoption challenges and measures shows that they are indeed multifaceted in terms of time and space. The examples used in this article to illustrate their diverse nature highlight the complexity of ECS projects in which organizations and their different stakeholders can encounter a multitude of challenges over time. In the course of this, some challenges that, for example, prevent certain groups of actors from usage when the system is introduced, such as *Low support*, might later be nonexistent anymore when the employees have learned how to use the ECS and what (personal) benefits can be realized through use. Likewise, the measure *Usage of feedback mechanisms for reused content* might only be suitable for certain contexts and when the ECS adoption process is already at an advanced stage. Enterprise collaboration systems can be seen as sociotechnical systems that incorporate human and non-human actors, i.e. hardware and software as well as people, processes and organizational aspects [47]. The entanglement of human and material practices, including different ECS adoption challenges, changes over multiple time frames and settings. Organizations can try to address certain challenge in a preventive or counteractive manner but they have to accept and deal with uncertainty.

The power of users to impose new meaning on technology particularly applies to ECS, as they are designed through use. However, the way ECS use and its related challenges evolve over time and context lacks scientific attention. Since there is often the need to justify IT investment decisions, researchers tend to look at what companies expect from the ECS introduction, i.e. which benefits are expected (e.g., [29], [41], [58]). There is also a range of studies focusing both on ECS challenges and success factors as well as related adoption and appropriation strategies and methods (e.g., [19], [24], [61], [63]). Such studies were primarily used as a basis for this article. Although it is acknowledged that there is no universal solution for the successful adoption of ECS and gaining value from ECS, the findings of such studies are not only fragmented as stated before but are also prone to disregard the sociotechnical nature of ECS and the way it is

shaped. It is now time to address this drawback and consider the temporal and spatial facets of ECS that may lead to unexpected outcomes. Since ECS use is still in its relatively early days, there is the unique opportunity to track the evolution of it from the early implementation and learn from practice. Therefore, future studies of this research program aim to examine and understand what happens when such sociotechnical systems are evolving, i.e. how ECS are designed through use over time including contextual, technological and organizational events as well as changing work practices, stakeholders, challenges, measures, expectations and benefits. This will allow conclusions on why an ECS, a new form of information infrastructure [64], can be successfully used even if initial expectations are not met. The goal is not to generalize but to explore ECS use through in-depth, longitudinal case studies and to learn from the experiences organizations collect. Since this exploration of ECS use is a long-term endeavor that requires the consideration of multiple time frames and settings, there is a strong need to draw on different theoretical perspectives that provide analytical cues to the relevant sites and settings for investigation and that account for the complex and dynamic relationship between the social and the technical elements of ECS. For this purpose, it is planned to collect data from enterprises that have introduced ECS. This process is now underway with companies that are participants in our multi-organization practice-based research community [65].

## 6. Concluding remarks

A literature review on the adoption of enterprise social software and enterprise collaboration systems revealed that related research is currently fragmented and provides few in-depth empirical cases. To address this issue, a meta-analysis of ECS and ESS literature was conducted to provide an overview of identified and classified adoption challenges and measures. This in-depth literature analysis and synthesis was supplemented by triangulating interviews with companies. Two startup companies were willing to speak openly about their experiences with the introduction of ECS. Through the interviews additional challenges and measures that had not been identified as part of the literature analysis could be found. Both research and practice showed that ECS adoption challenges and measures can be linked to different time phases of the ECS project and different stakeholder groups. To illuminate the diverse nature of ECS challenges and measures, examples of both challenges and measures and their spatiotemporal characteristics were provided.

This article does not propose any mapping between specific ECS adoption challenges and specific measures, because it is assumed that the evolution of each ECS project is unique and there is no generally valid solution for the effective adoption of ECS. While this article successfully aggregates the findings of many localist studies it only broaches the diversity and multifacetedness of ECS adoption challenges and measures. It does not show in detail what happens when such sociotechnical systems are moving through time and space. Based on the findings of this article it was, however, possible to identify the theoretical and analytical imperatives for studying sociotechnical change of ECS and thus for gaining richer insights into the adoption, appropriation and use of ECS.

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**Abstract:**
Currently, internal IT organizations use outsourcing and offshore arrangements to achieve cost savings and gain access to new capabilities. It was found that suppliers' personnel at the operational level can face challenges with internalizing their operations based on the agreed outsourcing practices and transferred responsibilities. This study gives voice to the supplier and studies the impact of offshore outsourcing operation development activities. The internal IT unit from Nokia Devices selectively outsourced global IT service activities and responsibilities to the IT supplier. The outsourced activities were implemented by offshore centers in India and China. It was found that the global selective outsourcing environment (GSOE) did not provide a solution to all of their expectations, and new unexpected challenges occurred. Several practices, communication and information sharing, and behavior-related lessons learned items were identified. It was found that the GSOE operation needs to be developed and implemented in an agile and incremental manner, instead of a singular implementation approach. Also, the globally distributed teams' group dynamics critically impacted on the teams' ability to work. The lessons learned items and recommendations can be utilized by other companies during their mode-of-operation development.

**Keywords:**
global IT services; selective outsourcing; offshore outsourcing; quality practices; operation development.

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## 1. Introduction

Recently, several internal Information Technology (IT) departments have faced increasing pressure to achieve and accomplish more with less money and resources. One approach to solve the problem has been outsourcing services. Typical approaches are total or selective outsourcing of internal IT solutions and activities to external service providers (later called the suppliers) and to utilize the suppliers' offshore services. Despite the extensive amount of outsourcing knowledge and experiences, the outcomes from outsourcing arrangements can surprise and not always positively. For example, Lacity et al. [1] and Lacity and Rottman [2] have identified that the service purchasing company's side can be unprepared for the challenges, and Ikediashi et al. [3] found that suppliers can show underperformance. Previous studies, (e.g., [4]-[5]) found that outsourcing arrangements do not provide quick solutions or "silver bullets" to solve all existing problems or expectations. Also, the challenge is that no explicit standards or guidelines exist that define how companies should design and implement their outsourcing arrangements.

Outsourcing can bring about new kinds of failures, challenges in group dynamics, and negative impacts on customer satisfaction (e.g., Raassens et al. [6]). Typical outsourcing challenges are unsuccessful leadership and communication; as Lacity and Willcocks [7] described, without the right leaders the practices are less efficacious. Global operations in virtual teams include challenges when activities need to be implemented without constant face-to-face interaction [8]. Previous studies (e.g., [9]-[10]) have found that a favorable working atmosphere and cultural intelligence play an important role in successful interactions and relationship building between the outsourcing parties. Therefore, it is important that employers create a favorable atmosphere, which enables success and maintains enthusiasm [11]. However, Ohlsson [12] found that, in practice, it is challenging to create such an atmosphere, which helps organization members to master practices collectively and critically.

In this paper, the focus is on analyzing a global selective outsourcing environment (GSOE), which includes both the service purchasing company and the selected external service providers. In this kind of GSOE situation, the operational level personnel must be able to rapidly show a successful and coordinated operation and group dynamics that will provide the expected service outcomes and ensure customer satisfaction. The operational level problem studied in this paper is the supplier's challenges to internalize and operate based on the agreed GSOE roles, expectations, and jointly defined processes, and still meet the supplier's own internal requirements and practices. In earlier studies, this problem is approached by identifying various client, supplier, and relationship risks and challenges [1],[3],[13], identifying good and/or bad sides of outsourcing arrangements [14], or examining how outsourcing affects human resources [2],[15]. Therefore, the cause of outsourcing challenges can originate from both the service purchasing companies' and the suppliers' side. However, previous studies have not considered further operation development activities in an outsourcing situation and, thus, do not provide knowledge of the effectiveness and sustainability of such activities. In this research, the target is to study the effectiveness and sustainability of the implemented operation development activities in a real-life GSOE situation, and to propose focus areas for further iterative development.

In this paper, the examination point-of-view is on the supplier's side, and the voice is given to the supplier's operational level personnel. One of the internal IT units at Nokia Devices and its selected IT supplier implemented several outsourcing arrangements during 2009–2012. Therefore, it was an ideal case environment to find lessons learned items from offshore outsourcing arrangements. This study also further elaborates earlier studies [16]. To evaluate the effectiveness of the development activities, an action research method, interviews, questionnaires, and hands-on experience approaches were used to evaluate and present the findings. The corporate level elements are excluded, such as research and marketing, end-consumers' satisfaction, or company-wide leadership practices. The study begins by providing an overview of the relevant research on offshore outsourcing challenges, and section 3 describes the research methods and hypotheses. Section 4 presents the research results and analysis. The final section concludes the findings.

## 2. Literature

Based on Lee et al. [17], Kruise and Berry [18], and Ho and Atkins [19], IT outsourcing (ITO) focus areas have included the following historical phases: hardware (1960s), software (1970s), hardware, software, and communications (1980s), total solutions (1990s), and business process outsourcing, offshoring, and focusing on core-competencies (2000s). When it comes to the ITO mode, Lacity and Willcocks [20] and Dahlberg et al. [21] have used the following definition: "*Selective outsourcing means that the proportion of outsourced services is 20–80 % of the IT budget. Total outsourcing means that the proportion of outsourced services is over 80% of the IT budget.*" Also, the degree of outsourcing can vary, such as total or selective single-supplier, total or selective multi-supplier, insourcing, and strategic partnerships [20]-[22]. However, based on earlier studies [20]-[21], it is not possible to declare which ITO mode ensures definite success, because it is always a situation-specific decision and solution.

An offshore outsourced operation means that a significant amount of work will be implemented abroad. Rauffet et al. [23] identified two specific characteristics in a global operation. First, each site and/or subsidiary (e.g., offshore center) is relatively autonomous and has local management mechanisms that can differ between sites. Second, each site/subsidiary presents specificities that depend on its local history and geographical context (e.g., language, laws, culture, and traditions). Vernadat [24] noted that teams in different sites can standardize operations or adopt new kinds of practices. However, based on Rauffet et al. [23], this requires circumstances that enable innovation and enrich the organizational learning. These findings have similarities with Tynjälä [11] and Ohlsson [12]. Lönnblad and Vartiainen [25] also identified that a global situation requires specific employee and leader competencies and skills, such as a proactive working style, effective communication and interaction skills, a recognized global focus, cultural aspects, and flexibility.

A global operation is complex and demanding, and previous studies (e.g., Muhic and Johansson [26]) have reported various kinds of risks and challenges associated with outsourcing arrangements. Lacity et al. [1] wrote that outsourcing will continue to be a high-risk practice with significant hidden costs, over-promises, and under-deliveries. Ikediashi et al. [3] reported risks that included poor or absent service quality, suppliers' under-performance, contractual risks, inadequate definition of scope and services, and the loss of strategic flexibility. Lacity and Rottman [2] maintained that offshore arrangements included challenges to verify work estimates and hidden costs, and offshore personnel did not fully understand requirements or they were overly optimistic. Based on previous researches, such as Daim et al. [8], it is evident that operating across multiple time zones and national differences (such as national events affecting schedules) will have an impact on outcomes, communication, and interactions.

Ultimately, the success of offshore outsourcing arrangements depends on the personnel working at the operational level in the IT services. In an outsourcing situation, a lot of knowledge must be shared among the outsourcing parties, even when the personnel might be naturally antagonistic towards each other [27]. In previous studies [1],[28], one of the concerns in offshore arrangements was the high turnover rate of offshore personnel. Quite often, service purchasing companies complain that it is extremely expensive to train offshore employees due to the threat of turnover and the offshore employees' limited understanding of the service purchasing company's business domains [1]. In addition to this, Lacity and Rottman [2] found that in a nearshoring situation, the knowledge transfer happened incrementally over an extended period of time (e.g., several months), but with offshore personnel, it happened in an intensive timeframe (e.g., within two weeks). Furthermore, Lacity et al. [1] reported that after the transition phase, the suppliers' transformation leaders typically moved on to new challenges on new accounts, and the remaining personnel were too exhausted or lacked ideas to initiate new transformation or development activities. This kind of significant change in contacts and personnel can have a negative impact on the service purchasing company's satisfaction, stability of the IT services, knowledge transfer, knowledge retention, and sustainability of the outsourcing relationship.

Based on Westner and Strahringer [29], operational level IT offshore outsourcing success factors (e.g., in offshore information systems projects) include offshoring expertise (managing and conducting offshoring in an efficient and successful way), knowledge transfer (project/service-relevant explicit and implicit knowledge efficiently transferred to the offshore personnel), liaison quality (the degree of connection and quality practices in order to achieve the goals and

objectives), and trust (an actor will fulfill obligations, behave predictably and act fairly when the possibility of opportunism is present). Based on these success factors, the offshore outsourcing activities need to focus on leadership, organizational learning, and quality management practices to enable successful global operations, trust among the parties, and customer satisfaction. Fig. 1 presents the main elements and theories used in this paper in a house-model.

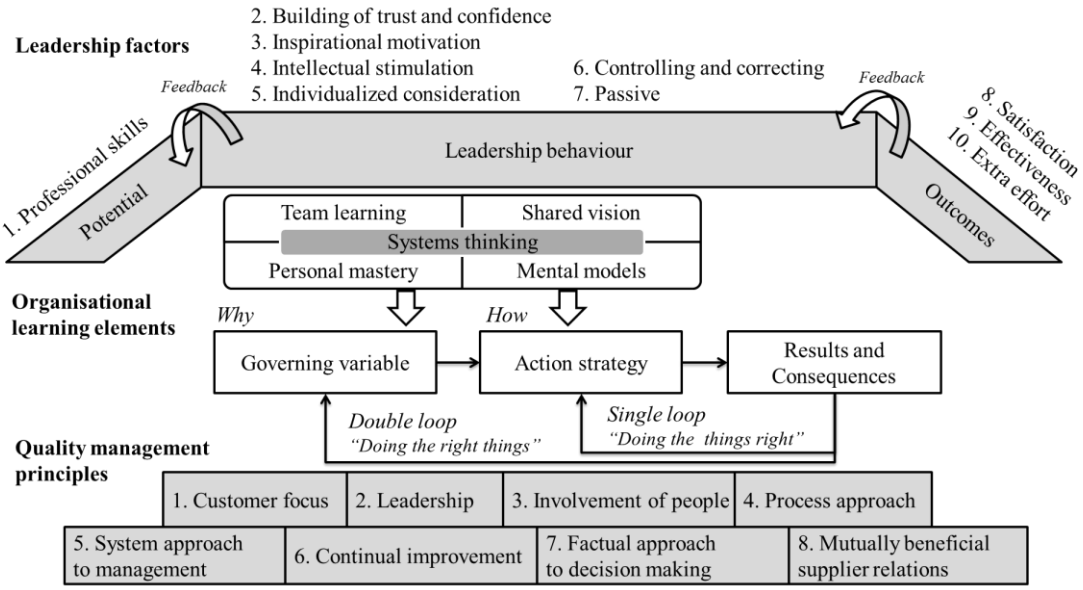


Fig. 1. Operational level success factors (adapted from ISO 9002:2008 [30]; Senge [32]; Argyris and Schön [34]-[35]; Nissinen [39]-[40]).

To ensure successful liaison quality, the outsourcing parties need to focus on implementing efficient quality management practices and a quality culture, for example, based on the ISO 9001:2008 eight quality management principles [30]. Over the years, quality management practices have been used to improve and increase companies' productivity and profits. The impacts of the ISO 9001 standard implementation were studied by Levine and Toffel [31]. They found, based on 916 adopters and 17,849 non-adopters, that the ISO 9001 adopters had higher growth rates for sales, employment, payroll, and average annual earnings than the non-adopters. In addition, focus is needed on quality leadership, because leaders need to take control and implement the needed processes (such as quality management practices, operational level processes, etc.), guide the operational level personnel, improve the operation and outcomes, and guide the (global) teams to make the right decisions.

Westner and Strahringer [29] identified knowledge transfer as one of the success factors that have an impact on learning. Senge [32] highlighted that typically companies fail to see the organization as a dynamic process, and their focus is on the parts rather than the whole. As a consequence, it has a negative impact on the success of knowledge transfer and organizational learning. Typically, people think that cause and effect will be relatively close to one another. Therefore, they implement short-term improvement activities, which often involve significant long-term costs and impacts (such as severe damages on the viability of an organization) [24]. Instead, based on Senge's [32] fifth discipline, the focus should be on systems thinking (Fig. 1), which leads to more appropriate action. However, Bui and Baruch [33] have argued that Senge's fifth discipline is difficult to translate into a systematic learning-process evaluation model.

The used learning and knowledge transfer approach also affects the outcomes and learning (i.e., superficial or deep approach). Single-loop learning (Fig. 1) is about achieving and maintaining the given targets with certain activities, whereas double-loop learning (Fig. 1) involves the elements of changing the objectives of the system (Argyris and Schön [34]-[35]). Argyris and Schön [34]-[35] pointed out that various underlying assumptions and beliefs can hinder and/or prevent double-loop learning. Therefore, superficial or deep approaches have an impact on the service outcomes and the operational level personnel's capabilities to innovate, learn, and develop the operation further. For simplification only, Argyris and Schön's [34]-[35] model is included in Fig. 1. Other researchers have further extended the learning model created by Argyris and Schön. For example, Tosey et al. [36] and Armitage et al. [37] wrote about triple-loop learning, which includes fundamental changes in governance, norms, and protocols.

One of the success factors identified by Westner and Strahringer [29] was offshoring expertise and trust, which in conjunction comprise the notion of successful leadership capability. Kotter [38] wrote that leadership is about vision, behavior, and getting people's commitment. In this study, the leadership approach was selected from Nissinen's [39]-[40] Deep Leadership model, which has been used in the Finnish defense forces' leadership training since 1998, and it is also the scientific model for the 360-profile development tool [41]. This transformational leadership model is based on leaders' potential, leadership behavior, and outcomes (Fig. 1). Accordingly, the focus is on motivation, learning, and trust. Interestingly, the model also includes two "non-leadership" dimensions: "controlling and corrective", and "passive," which highlight the possibility of inadequate leadership. Mäkinen [42] wrote that these two non-leadership dimensions may be alternatives for the model, but should not be part of it.

In summation, the challenges related to offshore outsourcing include leadership problems, contract-related risks, cultural challenges, hidden costs, overpromises, failures in knowledge transfer and quality management activities, high turnover rate of human resources, and underperformance. Despite earlier studies reporting offshore outsourcing success factors and failures, a knowledge gap still exists in the operational level implementation of offshore outsourcing development activities in a GSOE operation.

## 3. Research methods, data collection, and hypotheses

During 2009–2012, one service purchasing company's internal IT unit was responsible for developing and maintaining the global end-consumer IT services (such as an error reporting tool and end-consumer support services). To achieve cost savings, the service purchasing company made a strategic decision to use only a few preferred global large-scale suppliers that also offered offshore services. A significant amount of the case IT unit's IT development and service activities were selectively outsourced to the new supplier. However, the ultimate ownership of the IT services remained within the IT unit. Based on the defined outsourcing agreements, the supplier was responsible for executing and managing the operational level activities. The IT unit and the supplier jointly defined and implemented novel way-of-working approaches, strategies, and over 30 information technology infrastructure library (ITIL) processes to ensure good quality global operations [16]. A majority of the operational level activities were executed at the offshore centers in India and China.

Despite the extensive amount of preparation and implementation activities to ensure successful operations among the GSOE parties, the service purchasing company was dissatisfied when it came to the operations' development, outcomes, and interactions [16]. Therefore, various operational development activities were defined and implemented to improve the situation. This research aims to study the effectiveness and sustainability of the offshore outsourcing development activities from the point-of-view of the supplier's operational level personnel. Our main research approach was an action research method to participate in the practical problems, develop new processes and solutions, and observe the change effects and, thereby, obtain operational level knowledge and insights to propose focus areas for iterative operation development.

In the case of the IT unit, two current state analysis (CSA) interviews and surveys were conducted during 2010 and 2011, which provided various GSOE operation development needs to the supplier. At Nokia Devices, some interviewees did not want their interviews recorded (especially the representatives in Asia), and therefore, it was

decided together with the IT unit's leaders that the interviews would not be recorded. In addition, Nokia Devices (and Microsoft) and the IT supplier are restrictive in making public their operation, and for confidentiality reasons, it is not possible to present the activities or results in full detail. Therefore, this research presents only illustrations, analyses, and evaluations of the development activities.

After the decision not to record the interviews, all global IT unit members, such as team leaders, product and service managers, IT specialists responsible for architecture, databases, networks, and technical solutions, agreed to participate in the CSA interviews, and they freely shared their perceptions. The interview notes were written down by the interviewer (one of the authors of this paper) during the interviews by capturing the main messages and ideas. The interviews in Europe were conducted face-to-face, and phone interviews were used with the representatives working in Asia and the Americas. These interview notes were theme-based coded to identify development needs. Based on the CSA themes, a set of development focus areas were constructed under three categories: 1) Practice; 2) Interaction and information sharing; and 3) Behavior and mind-set (Table 1). These focus areas will be discussed and analyzed further in section 4, where each focus area will be covered with the supplier's lessons learned findings. The interviews included a variety of themes, for example, global IT projects and services, contracting, quality and risk management, communication and interaction, training and competencies, etc. The same interview frame and themes were used in both CSA interview rounds. Also, the IT unit's members provided a numerical satisfaction evaluation, and the survey included the same themes as the CSA interviews. Therefore, the survey focused on measuring the IT unit's satisfaction before and after the development activities.

Table 1. The offshore outsourcing development focus areas based on the CSA findings

| **Category** | **Focus area** | **Examples of the identified development needs** |
|---|---|---|
| C1 Practice | C1.1 Operation management | Avoid underperformance<br>Operate according to the jointly defined processes |
| | C1.2 Quality Management | Lack of quality activities and results to achieve progress visibility over the operational level activities |
| C2 Interaction and information sharing | C2.1 Knowledge transfer | Challenges in knowledge transfer and learning operational level activities and responsibilities<br>High turnover rate at the offshore centers |
| | C2.2 GSOE relationship | Maintain the enthusiasm and commitment of investing in the GSOE relationship after the contracting phase |
| | C2.3 Communication | Improve the communication-triangle: IT unit – Supplier onsite – Supplier offshore |
| C3 Behavior/ mind-set | C3.1 Group dynamics | To achieve consensus among the globally distributed GSOE teams to ensure ability-to-work |
| | C3.2 Mind-set | Operate based on selective outsourcing approach and transferred responsibilities instead of resource-based approach |

The supplier established a development team (later called the global team), and the team planned and managed the implementation of the development activities. After the implementation phase (beginning of 2012), the global team members were interviewed, such as account leaders, quality managers, and project managers responsible for development activities. The interview questions focused on analyzing the supplier's development project, the definition and implementation phases, the team's communication and interactions, and the team's various lessons learned items. In addition, a survey was sent to the operational level personnel (i.e., IT specialists) working at the India and China offshore centers to study the effectiveness and sustainability of the implemented activities from their point-of-view. The surveys included both numeric and open questions, and the main themes were: 1) development project's communication, roles and responsibilities, and ability to have an impact on corrective activities; and 2) the impact of the

implemented corrective activities, risk and quality management, and lessons learned items. The survey focused on analyzing the activities' sustainability on daily operational level activities.

This paper aims to study the effectiveness of the development activities from the operational level personnel's point-of-view based on their lessons learned findings. This study suggests the following set of hypotheses:

H1: *Leaders have a tendency to focus on short-term activities and implement "quick-fixes" during operation development activities instead of long-term improvements, which prevents operational level sustainability and learning.*

H2: *The lack of successful communication and interactions in a GSOE situation can lead to a micro-management approach, which limits operational level success and the personnel's commitment.*

In this paper, we used existing interview and survey materials. First, we analyzed and coded the IT unit's CSA interview notes and created the offshore outsourcing development focus areas (Table 1). Second, we analyzed the supplier's interview notes and the offshore centers' survey materials. We identified lessons learned items under three categories as defined in Table 1. In section 4, Tables 3–5 present the main lessons learned items per category. Third, based on the lessons learned items, a set of recommendations were identified for further iterative development.

## 4. Results and analysis

### *4.1 The service purchasing company's satisfaction results*

Table 2 shows the service purchasing company's satisfaction results based on the CSA surveys. The target level was set at 3.5, which was defined by the service purchasing company's leaders. The initial CSA satisfaction result (3.2) was below the target. Based on the CSA findings, the supplier defined and implemented several development activities. After the development activities, the new result (3.7) was above the target. The results indicate that the development activities had a positive impact on the service purchasing company's satisfaction.

Table 2. The service purchasing company's satisfaction results

| Offshore site | Original value | New value | Change% |
|---|---|---|---|
| India | 2.7 | 3.5 | 30 |
| China | 4.0 | 4.3 | 5 |
| Both centers | 3.2 | 3.7 | 17 |

When the results were analyzed based on the offshore centers, it was apparent that the China offshore center had substantially better results than the India offshore center (Table 2). The reason for this is that the China offshore center provided services only to China, whereas the India offshore center provided services to all other countries. Therefore, China's offshore center did not face the same cultural, language, and geographical distance challenges as India's offshore center. A majority of the development and implementation activities happened in India, and India's change percent was 30%, whereas China's change percent was only 5%. This finding supports Rauffet et al. [23], who found that offshore teams were relatively autonomous and had local management mechanisms that differed between sites.

### *4.2 The supplier's findings and perceptions*

The main responsibility for the development activities was on the supplier's side as the supplier was responsible for the operational level execution. The global team, which was located in Europe, was responsible for leading the planning and implementation activities. The global team included both leaders and specialists, and the multi-national group represented several cultures and backgrounds.

In this research, it was found that the development and corrective activities had already been limited at the very beginning by the supplier's leaders: "*Find those things that are broken and fix them. Find the 'low-hanging fruits' to achieve the customer's satisfaction. Continuous improvement activities can be done in other streams as well."* This guideline placed the development focus on short-term activities (corresponds with H1). The guideline was contradictory to the systems thinking approach (cf. Senge [32]), and it also followed the single-loop learning approach (cf. Argyris and Schön [34]-[35]). Therefore, the leaders' aim was to achieve the expected targets without fundamental changes to the existing operational practices and underlying assumptions; consequently, they did not achieve any benefit from the double-loop learning approach.

This limitation also indicated that financial elements had a significant impact on the development activities. The main target was to find quick solutions to achieve the service purchasing company's satisfaction with a minimum amount of investment. However, this approach neither guaranteed changes in personnel's mind-set or behavior, nor ensured that the operational level personnel would commit to the implemented activities in the long run. One of the main findings from this study was that the offshore outsourced GSOE operation should include continuous improvement practices. The GSOE operation should be developed incrementally and utilize an agile approach, rather than a massive waterfall-based development approach.

### *4.3 Category: practice*

To improve the existing situation, the GSOE parties ensured that the operational level teams would follow the expected compliance requirements as defined in the contracts and jointly agreed practices. The supplier and the IT unit provided retraining (e.g., ITIL processes and the jointly agreed mode-of-operation practices). The idea was to ensure that the operational level personnel knew the "why" elements of the operation and business domains. It was observed that the operational level team members were enthusiastic about developing their practices and considered it important to improve the existing routines and performance quality. However, some of the supplier's leaders did not commit to the idea of proactively developing the practices without extra payment. As an example, one of the leaders commented: *"Make this a project where money is involved. If there is no money, there are two things: 1) no interest; 2) the priorities are what they are, and the end-result is not guaranteed and it includes more risks"*. Based on this, the expectation was to only implement activities based on purchase orders without taking any responsibility to improve the operational level practices and outcomes proactively, despite the transferred responsibilities (corresponds with H1).

A majority of the planning activities were defined by the global team, but the offshore centers implemented the activities. The visibility over the implemented actions was not always optimal due to the geographical distance. Also, some of the planned activities were not always clear enough to be implemented and followed by metrics (impact on H1). After the implementation phase, the global team considered that the implemented activities were more effective compared to the offshore teams' assessment. This finding could be explained by the global team members becoming more familiar with the offshore centers' daily activities (corresponds with Rauffet et al. [23]), but the true level of the effects on daily activities was not that significant as assessed by the offshore teams (supports H1).

In this research, it was found that the supplier implemented several practice-related activities that had a positive impact on the service purchasing company's satisfaction (Table 2). However, there was still room for further improvement. Table 3 presents the global and offshore teams' main lessons learned findings from the planning and implementation phases based on the focus areas defined in Table 1.

The analysis of the lessons learned items highlighted that more focus was needed on practice development:

- The supplier's personnel should get more "need-analysis" competency development. The supplier should focus on analyzing and understanding the received feedback/CSA findings. However, in this case, the global team "jumped" directly to the implementation phase without a proper need-analysis phase. Therefore, it remained unclear what the offshore teams truly implemented and how much the implemented activities improved the operational level's day-to-day work. To fix this situation, the global and offshore teams need to jointly analyze

and identify the root causes of the non-conformances, and based on this analysis, define the needed development and corrective activities;

- Follow-up metrics and situational targets need to be defined and implemented. The needed quality management practices must be incorporated into the daily practices, processes, and tooling. Only in this way will the quality management activities be conducted as expected. The operational level personnel need quality management training to ensure that all have the same knowledge and understanding of the quality culture, expectations, and practices (e.g., Six Sigma, ISO 9001). Most importantly, more focus and competencies are needed for quality leadership;
- Leadership competencies need to be developed. It is important to recognize the difference between management and leadership. In this case, the leadership elements were especially missing. Leadership is needed to lead the people, set the direction and vision for the GSOE operation, and create something new and inspiring that advances overall commitment. It is essential for leadership skills to be developed on an ongoing basis to ensure continuous leadership competence (corresponds with Nissinen [39]-[40]).

Table 3. Practice-related lessons learned items

| **Practice lessons learned items** | **Focus area** |
|---|---|
| Ensure that funding is in place before starting any actions. | C1.1 Operation management |
| Verify that it is possible to implement the planned activities and there is a need to make changes to the scope. | C1.1 Operation management |
| Make sure that there is enough time to concentrate on implementing the defined activities. | C1.1 Operation management |
| Clarify and communicate schedules and action items in detail. | C1.1 Operation management |
| Use ad hoc/agile approaches to implement improvements. | C1.1 Operation management |
| Ensure that there are mandates and top-management sponsors in place to make changes on both sides. | C1.2 Quality management |
| Implement the development activities in a real project approach with clear targets and the right resources. | C1.2 Quality management |
| Implement good follow-up practices to show the achievements, added value, and benefits of the activities to the management and operational level teams. | C1.2 Quality management |
| Implement a clear way-of-doing structure from the very beginning. | C1.2 Quality management |
| Conduct regular meetings to ensure successful implementation of the expected processes and quality practices. | C1.2 Quality management |
| Ensure that the activities, commitment, structured approach, plans, ownerships, expectations, targets, and direction are clearly in place, defined, and understood. | C1.1 Operation management<br>C1.2 Quality management |

### *4.4 Category: interaction and information-sharing*

It was observed that the high turnover of human resources had a significant impact on the teams' learning and information sharing (corresponds with [1], [28]). First, the global team's project leader changed several times; therefore, the planning activities became scattered and were started several times from scratch. These circumstances indicate that the supplier's leaders focused on short-term investments instead of long-term development by ensuring stable resource allocation (supports H1). Based on the interviews, the handovers were not always conducted successfully, thereby creating challenges for the successor. Second, the high turnover rate among offshore personnel had a negative impact on the IT services' stability, organizational learning, and the team members' ability to retain the knowledge and skills. In addition, it was found that the global and onsite team members' lack of operational level progress visibility and the lack

of direct interaction with the offshore centers' specialists (because of cultural differences) led to a micro-management approach (supports H2).

When analyzing the supplier's interactions with the teams, it appeared that the global team's cooperation was successful. However, the offshore centers and the service purchasing company's representatives were not part of the group of insiders. Therefore, the true benefits from successful cooperation among the GSOE parties were not achieved.

Based on the findings, the quality of the communication (e.g., interpretation of the message) included challenges: *"Communication is very important. However, we didn't always pay enough attention when we heard things. Maybe we thought that we understood what we heard, but did we really? We should have dug into it in more detail to see the core of the problem".* There were communication barriers between the people, such as cultural differences (e.g., only the offshore managers spoke during the meetings), attitudinal barriers (e.g., management challenges, change resistance), system design (e.g., organizational structure), and physical barriers (e.g., working in different countries).

This study revealed that there was quite a difference of opinion among the global, onsite, and offshore teams when it came to the success of communication and information sharing (corresponds with the findings of Rauffet et al. [23]). The two main challenge areas were: 1) the lack of up-to-date, clear, and regular communication; and 2) trust-related challenges that originated from the communication challenges. In addition, some of the operational level activities were not in place as agreed, and some of the activities were in place but not communicated (such as quality results). Therefore, the lack of operational progress visibility had a negative impact on the teams' overall trust and satisfaction. Consequently, a micro-management approach was used to gain the operational level progress visibility, which negatively affected the offshore team members' trust and satisfaction (supports H2).

During the implementation phase, various communication and interaction improvements were implemented, but it was recognized that sustaining the practices was challenging among the globally distributed teams. Table 4 summarizes the interaction and information-sharing lessons learned findings based on the focus areas defined in Table 1.

Table 4. Interaction and information-sharing lessons learned

| **Interaction and information-sharing lessons learned items** | **Focus area** |
|---|---|
| Implement a two-way feedback sharing approach. The supplier must also give feedback to the IT unit. | C2.1 Communication |
| Communicate clearly to the people what needs to be done and ensure that they take the activities seriously. | C2.1 Communication |
| Focus on efficient and timely handovers between people. | C2.2 Knowledge transfer |
| Training and knowledge transfer scopes, targets, and measurement practices must be re-defined, documented, and communicated clearly. | C2.2 Knowledge transfer |
| Communication must focus equally on both internal and external parties. | C2.3 GSOE relationship |
| It is important to proactively ask for feedback internally and from the service purchasing company. | C2.3 GSOE relationship |
| Arrange two feedback collection sessions: 1) common session to collect generic feedback; and 2) service specific session. | C2.3 GSOE relationship |
| Create a power-map together with the service purchasing company and identify the people who must be part of the activities. | C2.3 GSOE relationship |

Based on the lessons learned items and observation findings, it was clear that more development and improvements were needed in communication and interaction practices:

- One of the main challenges was poorly managed handovers. The supplier should define and implement effective handover practices;
- The supplier should implement active customer expectation management practices to ensure that they are able to fulfil the service purchasing company's needs to their satisfaction. This approach would also support ISO9001:2008 [27] customer focus and Senge's [32] shared vision approaches;
- The supplier must focus on ensuring that the GSOE communication triangle works efficiently (i.e., IT unit – supplier onsite – supplier offshore). Improving only the supplier's internal communication does not increase the service purchasing company's satisfaction or provide operational level progress visibility to all of the GSOE parties;
- More focus is needed on training arrangements. Especially in an offshore outsourcing situation, the IT trainers should have training competencies and preferably pedagogical knowledge. In addition, the trainers need to have hands-on experience (e.g., using ITIL processes in a global IT service outsourcing situation). The service purchasing company must be an integral part of the training arrangements, as they have the core-business knowledge. It is important to share the "why" knowledge with the operational level personnel and to not only focus on the "what" and "how" aspects. Successful training management, which also includes clear definitions of the targets, practices, and content, can bring cost savings and decrease the need to retrain.

### *4.5 Category: behavior and mind-set*

It was identified that the operational level teams' performance outcomes were shared experiences. Fig. 2 illustrates the globally distributed teams' group dynamics. The teams' operations were guided by several process descriptions (such as ITIL processes), assumptions, hopes, and explicit targets (such as contracts and service orders). The GSOE leaders played a critical role in guiding and leading the globally distributed teams' operations. However, the leaders failed to engage the operational level teams, which negatively affected the consensus and the teams' ability-to-work (supports H1 and H2). Based on the interviews, action research observations, and various discussions with the representatives of the supplier and the service purchasing company, it was identified that the teams' basic form of unity was "disharmony" and "differences of opinion." It appeared that the teams were temporarily able to reach a consensus and mutual understanding, but eventually, they reverted to a state of disharmony. Usually, this illusion of harmony was achieved after using a strong managerial grip and a micro-management approach. Even when it seemed that the expected mutual understanding was achieved, in reality, individuals (especially at the offshore centers) hid their real thoughts, and they simply attempted to operate based on the explicit rules. When the micro-management grip loosened, the operational level personnel reverted to their former way-of-working approach. These findings support H2.

Based on action research observations, it was evident that the teams' group dynamics had a significant impact on the quality of operations and outcomes (Fig. 2). In fact, it appeared that the group dynamics affected more than the official targets, such as service orders. The teams' ability-to-work included two key elements: 1) a sufficient consensus to enable cooperation; and 2) a sufficient individual independency to enable innovation (Fig. 2). The consensus had an impact on the group's ability to cooperate internally and with other groups (such as the supplier's onsite and offshore teams, the IT unit's teams). The cooperation among the teams also included challenges, prejudices, and schism. The GSOE leaders attempted to solve the situation by agreeing on "the basic operating rules" and standardizing the service deliveries. However, the lack of individual independency prevented innovation. The micro-management grip (e.g., conducted by the IT unit and the global team) caused frustration and most likely negatively affected the turnover rate at the offshore centers. These finding support H2.

An interesting finding was that the global team's leaders understood and perceived their roles, responsibilities, and activities differently than the rest of the global team's members. The leaders perceived themselves as active and participative. Nevertheless, other global team members commented: *"The management was involved what came to*

*words, but the actual time given to this topic, I would say it was more disconnected and it felt like: 'YOU – take care of this'. Management level people somehow managed to outsource themselves out of the whole case."* The other global team members expected the leaders' commitment in sustaining the changes in the operational level's activities and behavior. Instead, some of the leaders transferred their own responsibilities to the operational level personnel, although they did not have the necessary mandate and power to ensure the cultural and behavioral changes. This caused dissatisfaction and frustration among the operational level personnel (supports H1). These findings also correspond with Nissinen's [29]-[30] non-leadership elements: "controlling and corrective" and "passive."

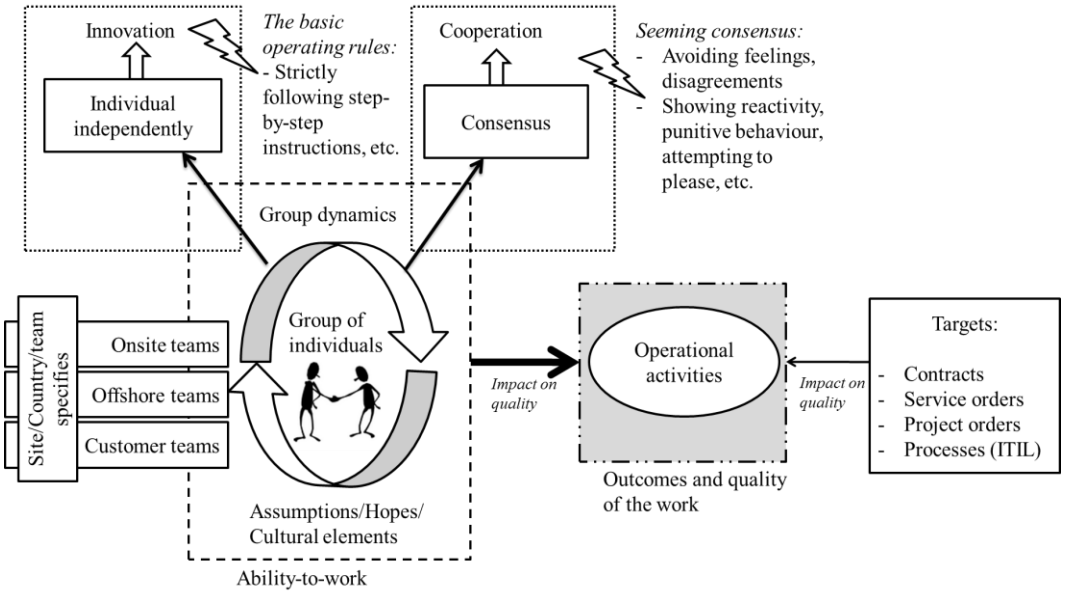


Fig. 2. The group dynamics model

Changing the existing mind-set and way-of-working practices was challenging. As an example, the global team's members had challenges recognizing that the main target of the development activities was to improve the operation, rather than making the reports and metrics look "green" just for the sake of reporting. The global and offshore teams' behavior and mind-set lessons learned findings are listed in Table 5 based on the focus areas defined in Table 1.

Based on the lessons learned analysis, there was still room for behavior and mind-set development:

- The supplier's personnel (both leaders and operational level personnel) need to operate based on the transferred responsibilities and not on a resource-based approach in a selective outsourcing situation. Therefore, the supplier should not expect the service purchasing company to lead all of the operation and development activities on behalf of the supplier;
- The leaders need to commit to and focus on engaging the operational level personnel in the GSOE operation. If the leaders do not commit to the implemented changes, in practice, this means that the changes will not become permanent. This may require leader-specific training arrangements and competency development;
- A lot of training and mind-set changes are needed to ensure a successful mode-of-operation change from the resource-based operation to the selective outsourcing-based operation, where the supplier truly is responsible for the operational level implementation and development activities;

- The supplier needs to proactively develop the operation instead of waiting for the service purchasing company to define all the activities in detail. From the GSOE cooperation point of view, it is important to focus on GSOE relationship management and to improve trust and trustworthiness between the GSOE parties. This would enable timely and efficient problem and non-conformance solving;
- The onsite and global teams should not micro-manage offshore centers, and the offshore centers cannot be ignored or run roughshod over by other teams. Otherwise, the offshore centers will not commit. In addition, the micro-management approach will negatively affect trust and satisfaction. It is important to recognize the cultural elements of the operation, and the totality of the global system.

Table 5. Behavior and mind-set lessons learned

| **Behavior and mind-set lessons learned items** | **Focus area** |
|---|---|
| Proactively collect the needed information. | C3.1 Mind-set |
| It is useful to be visible and show presence to the operational level personnel. That way, the operational level people can show what they are doing and ask questions if needed. | C3.1 Mind-set |
| The supplier should be active instead of waiting for the IT unit to tell us what we should do. | C3.1 Mind-set |
| There is a need for mind-set changes. Delivering only outcomes is not enough for the customer, and the end-to-end operations and practices must be developed all the time. | C3.1 Mind-set |
| It is important to think about what is really useful and to not just start doing things. Focus on concrete things and activities; do not just write reports for the sake of reporting. | C3.1 Mind-set |
| Participate in the meetings; do not just rely on the heard comments. | C3.2 Group dynamics |
| Implement activities as a joint effort. Sustaining changes will require the cooperation and commitment of both parties. | C3.2 Group dynamics |

## 5. Conclusion

This research provided the supplier's point of view of the operational level development outcomes in a global selective IT outsourcing situation. The findings included various practices, interaction and information sharing, and behavior-related development items. This research provided examples and knowledge for different types of companies to develop their selective outsourced operations and group dynamics in a global selective outsourcing situation.

The research provided insights into real-life situations and experiences. The study analyzed the outsourcing development activities and presented the supplier's point of view, instead of the service purchasing company's perceptions. The main managerial implications of this study can be concluded as a need to focus on leadership capabilities, quality management practices, knowledge transfer and successful training arrangements, and trainers' competencies. The offshore outsourcing development should follow agile and incremental development approaches, and the GSOE operation should include continuous improvement practices. From a theoretical perspective, the article provided lessons learned findings that expanded the knowledge of selective outsourcing development. The findings complement existing studies by expanding the understanding of the need to implement development activities in an agile and incremental approach, and to focus on efficient and timely knowledge-transfer activities. The article also analyzed the globally distributed teams' group dynamics and its criticality in the teams' ability-to-work.

Naturally, it is acknowledged that this research has some limitations. The data and the examples are from only one case environment and its global operations in those specific circumstances. It is recognized that the case environment's choices and decisions were in response to specific situations. However, Nokia Devices and its IT supplier have a wealth of experience with offshore outsourced operations, global operations, and IT service delivery arrangements. In addition,

their employees' knowledge and competencies are well recognized. Therefore, this study provides useful lessons that other companies can benefit from. A further study should be done to investigate the results in different types of environments in other companies, and to test the transferability of the lessons learned findings and the form of group dynamics.

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**Abstract:**
Lean Management is a standard production mode that has been familiar to production organizations for several decades. To date, however, academic literature has presented surprisingly little information about the application of Lean Management in Information Technology (IT) organizations, or what is called *Lean IT*. Drawing upon an empirical qualitative case study of the IT departments of two multinational companies, in this paper we identify change management lessons learned for Lean IT implementations, as well as seven characteristics of a corresponding change management approach. As an extension of our work, researchers should validate and expand our initial findings, preferably in a quantitative setting.

**Keywords:**
Lean Management; Lean IT; implementation; case study; lessons learned.

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## 1. Introduction

As a standard production mode in modern manufacturing [1], Lean Management (LM) has been familiar within production organizations for several decades [2]. Inspired by its success in those organizations, many nonproduction organizations - for example, in healthcare [3, 4], public service [5], and construction [6, 7] - have begun to take a closer look at LM.

Among academics and practitioners, interest in LM also extends to Information Systems (IS), as demonstrated in scholarly work [8–11] and in numerous practical publications by management consultancies [12–14], in cases on LM implementations in IT departments such as BBC Worldwide, Fujitsu Services, Tesco, TransUnion, and Wipro [15–17], and by the existence of large groups in business-oriented social networks (as of February 2017, the group Lean IT Service Management on LinkedIn counts ~3,800 members). Such interest does not come as a surprise, as commonly mentioned objectives of LM implementations - for instance, high quality, low cost, short lead times, safety, and high morale [18] - often pose stumbling blocks for IT executives [19].

Although the objectives of Lean IT implementation seem worthwhile, most LM implementations fail to achieve anticipated results [20, 21]. In two studies on the success factors of implementing Lean IT [22] and the associated roles and phases [23], we found evidence that Lean IT, unlike other change programs, puts great emphasis on the bottom-up side of change - for example, by making sure that employees in a group are responsible for parts of implementation - and top-down leadership support in change management (CM) approaches concurrently.

In response, we investigate the following research question:

*What are change management lessons learned for a Lean IT implementation*?

In this paper, we apply an exploratory empirical–qualitative approach using case studies as our research method. Herein, we first conceptualize Lean IT and describe the CM framework employed. Second, we describe the cases and outline the applied method, after which we analyze the results in the light of two CM perspectives. We close the paper with a brief conclusion and outlook for further research on the topic.

## 2. Research background

### *2.1 Lean IT*

*Lean IT* refers to a holistic management system based on philosophy, principles, and tools. Lean IT aims at systematic management of continuous improvement by reducing waste and variability as well as enhancing value and flexibility in all functions of an IT department [24]. Using that definition, we follow Arlbjörn et al.'s [25] conceptualization of LM for production organizations, in terms of philosophy, principles, and tools, and transfer it to IT departments [cf. 24]. The following sections conceptualize Lean IT according to Arlbjörn et al. [25].

*Philosophy*: Lean IT aims to reduce waste - that is, "any human activity which absorbs resources but creates no value" [26, p. 15] - and develop customer value. In that sense, *value* is any "capability provided to a customer at the right time at an appropriate price, as defined in each case by the customer" [26, p. 311] and can be easily transferred to the context of IT departments - for instance, by fulfilling service-level agreements about server storage or the reliability of an Enterprise Resource Planning (ERP) system [24]. At the same time, waste can also be transferred to IT departments, however differs from that in production organizations [27]; examples include the overprovision of services, the over-specification of services that thereby go unused, redundant handling of work or data, defects (e.g., bugs), and excessive wait times for approval, information, or resources [28].

*Principles*: Arlbjörn et al. [25] mention five principles of action, primarily in reference to Womack and Jones [29], that are also relevant to IT departments:

(1) *Specify value from the customer's perspective*. Instead of focusing only on efficient service delivery, IT departments should understand what exactly creates value for internal or external customers and act accordingly.

(2) *Identify all steps necessary to designing, ordering, and producing products across the value stream in order to highlight nonvalue-adding waste.* Identifying waste requires transparency in processes and value streams, which for IT departments is challenging since service delivery is commonly less delineated and standardized than the production of physical goods.

(3) *Create flow without interruption, detours, backflows, waiting, or scrap.* After identifying nonvalue-adding waste, flow can be achieved by retaining only value-adding and necessary nonvalue-adding process steps and by removing unnecessary nonvalue-adding ones.

(4) *Produce only what the customer pulls*. This principle balances the terms *waste* and *value* because every service delivered that is not directly requested by the customer is considered to be waste - for example, software functionality that is never used [cf. 28] or the provision of high-performance server capacity for computationally low-level tasks.

(5) *Eliminate successive layers of waste as they are uncovered*. As for any organization, continuous improvement is also applicable to IT departments [24].

*Tools*: To bring the described philosophy and principles to life, LM uses a variety of tools, including 5S, Information Boards, Kanban, Overall Equipment Effectiveness, Pull Production, and Value Stream Mapping [25]. We argue that many tools are transferable to IT departments, yet also that there is no fixed set of tools, since every tool used to execute the described principles and philosophy can be considered to be a Lean IT tool [24].

### *2.2 CM approaches*

To interpret our case study findings in the light of literature, we examined different CM frameworks (e.g., Kotter's 8 steps model [30], Lewin's 3 steps model [31], and Armenakis' and Harris' institutionalizing change model [32]) and identified the work of Pascale and Sternin [33] as most applicable, given their concurrent incorporation of the bottom-up and top-down perspectives of change in their framework. They moreover based their findings on inductive research covering 14 years as well as many corporate and public change programs. Their dual-angle perspective, as well as their broad, in-depth dataset, was decisive for our selection. Pascale and Sternin [33] differentiate two stereotypes of CM approaches: the traditional approach to change and the positive deviance approach (cf. Fig. 1).

On the one hand, the traditional approach is described as a top-down, outside-in, and deficit-based approach that seeks to fix only what is wrong. When a solution is identified, the change program is implemented at all organizational levels. Leadership takes over ownership to implement the change, and resistance typically arises from ideas imposed by outsiders and stakeholders who are usually associated with the problem in focus. The traditional approach is especially appropriate when problem solving relies heavily on cognitive efforts and when behavioral adjustments are not greatly required [33].

On the other, the positive deviance approach is described as a bottom-up, inside-out, and asset-based approach, in which the community takes over ownership while implementing change. To minimize social distance, that circumstance often reduces the acceptance of change, and innovators are identified and leveraged to implement change. The positive deviance approach is especially appropriate when behavioral and attitudinal changes are sought [33].

| Traditional approach to change | | Positive deviance approach to change |
|---|---|---|
| **Leadership as path breaker**<br>Primary ownership and momentum for change come from above. | 1 | **Leadership as inquiry**<br>Leader facilitates search; community takes ownership of the quest for change. |
| **Outside in**<br>Experts identify and disseminate best practices. | 2 | **Inside out**<br>Community identifies preexisting solutions and amplifies them. |
| **Deficit based**<br>Leaders deconstruct common problems and recommend best-practice solutions. Implication: "Why aren't you as good as your peers?" | 3 | **Asset based**<br>Community leverages preexisting solutions practiced by those who succeed against the odds. |
| **Logic driven**<br>Participants think into a new way of acting. | 4 | **Learning driven**<br>Participants act into a new way of thinking. |
| **Vulnerable to transplant rejection**<br>Resistance arises from ideas imported or imposed by outsiders. | 5 | **Open to self-replication**<br>Latent wisdom is tapped within a community to circumvent the social system's reaction. |
| **From problem solving to solution identification**<br>Best practices are applied to problems defined within the context of existing parameters. | 6 | **From solution identification to problem solving**<br>Solution space is expanded through the discovery of new parameters. |
| **Focused on protagonists**<br>Engages stakeholders who would be conventionally associated with the problem. | 7 | **Focused on enlarging the network**<br>Identifies stakeholders beyond those directly involved with the problem. |

Fig. 1. Traditional and positive deviance approach to change [33, p. 75]

## 3. Case study companies and methodology

### *3.1 Case study companies*

In order to investigate the research question at hand, we observed two IT departments of renowned companies – Company A, a financial service provider, and Company B, a business in the car manufacturing industry (cf. Table 1 for a detailed overview) – and investigated their current experiences with implementing Lean IT. Given their size, prominence, and international focus, both companies are suitable for case study research [34]. The cases differ from their context, as Company A had no previous experience with LM, whereas Company B had already successfully implemented LM in its manufacturing functions, yet not in its service functions. However, as both companies shared (to a large extent) a comparable approach with regard to implementation phases and roles (findings described in section 4),

we could use this joint starting point to focus more clearly on the details with regard to the change management approach and to deepen the understanding beyond the general implementation setup.

Table 1. Overview of companies in the case study

| *Category* | *Company A* | *Company B* |
|---|---|---|
| Industry | Financial services | Car manufacturing |
| Employees, revenue, and global reach (unspecific to ensure anonymity) | Employees: >20,000 | Employees: >60,000 |
| | Revenue: > USD $25 billion | Revenue: > USD $50 billion |
| | Active in >120 countries | Active in >150 countries |
| Unit of analysis | Lean Management implementation in IT department | Lean Management implementation in IT department |
| Focus of implementation | Application development and maintenance | Application development and maintenance as well as Infrastructure services |
| Main reason for implementation | To improve efficiency in order to deliver more projects with the same staff | To improve efficiency in order to prepare for digitalization |
| Planned duration of implementation | ~3–4 years | ~2.5–3 years |
| Current status of implementation | Ongoing | Ongoing |

### *3.2 Case study methodology*

The applied methodology is an exploratory empirical–qualitative case study that builds on a previous research-in-progress paper [22] and a practitioner-oriented journal article [23]. Compared to the former, our study extends the original dataset by incorporating a second case company observation; compared to the latter, it investigates a different research question.

The applied method is rooted in established case study research [35, 36] and follows an IS case study protocol by Pan and Tan [34] involving eight steps: negotiating access, conceptualizing the phenomenon, collecting and organizing initial data, constructing and extending the theoretical lens, confirming and validating data, devising and applying selective coding, ensuring the alignment of theory and data, and writing the case report. Each step was carried out as follows.

*Negotiating access:* We used our network of personal and professional contacts to gain access to the Lean IT program managers of the case companies. *Conceptualizing the phenomenon:* Based on two thorough reviews of literature on Lean IT in general and Lean IT implementation success factors in particular, we conceptualized Lean IT from two perspectives. First, we analyzed nontechnical literature from which we could possibly gather background information. Second, we broadly analyzed different theories applicable to the context. Following this analysis, we formulated initial hypotheses for the theoretical background of Lean IT. *Collecting and organizing initial data:* First, we refined the interview questionnaire with three experienced researchers during pilot interviews. To glean an initial understanding and to select appropriate interview partners, we discussed the background and context of the implementation with the companies' Lean IT program managers, with whom we facilitated all activities listed in the following sections. *Constructing and extending the theoretical lens:* Since implementing Lean IT changes how daily work is conducted, it qualifies as a program of change. Given that many LM implementations have failed in the past [20, 21], we adopted the research focus of investigating what CM lessons had been learned. The underlying CM approaches serve as our theoretical lenses, as discussed in the detailed explanation in Section 4. *Confirming and validating data:* Using data

triangulation, we collected data from several sources, including interviews, field observations, and documents of important meetings. In total, we conducted 25 interviews during 5 months - 14 in Company A and 11 in Company B - 20 of which we conducted in person and onsite and the other five over the phone. The interviews were scheduled within a 90 minutes timeframe of which we used half for introduction and conclusion and the other half for conducting the semi-structured content part. We commenced interviews after Company A had been implementing Lean IT for 9 months and Company B for 11 months; the total planned implementation duration was 3–4 years for Company A and 2.5–3 years for Company B. Although implementation was not finished during our study period, both companies had already perceived their implementation efforts positively and were satisfied with the initial results of having Lean IT in certain organizational groups. To answer the research question from different perspectives, we decided to interview employees in different roles (cf. Table 2), the responsibilities of which are detailed in the following section. Seven accompanying field visits and a review of archived documents regarding the most important meetings ensured the triangulation of data. We refined our findings from data collection round to data collection round. *Devising and applying selective coding:* We transcribed and coded all interviews using open and axial coding to determine common themes, identify propositions, and reflect on focus points for the next round of data collection. *Ensuring the alignment of theory and data:* Following each round of data collection, we reflected on the alignment between the research context and the applied theories and made changes accordingly. *Writing the case report:* The final case report is the paper at hand.

Table 2. Overview of roles of interviewees

| *Interviewee category* | *Company A* | *Company B* |
|---|---|---|
| Program management | 3 | 3 |
| Group participants | 6 | 3 |
| Core implementation team | 5 | 5 |
| Total interviews | 14 | 11 |

## 4. Findings and interpretation

### *4.1 Findings related to observed implementation approaches*

Both case companies used an implementation setup with key roles of employees and implementation phases, which is described in the following section [c.f. 23]. However, this general setup only served as a guideline for each group. In practice, phases were shortened or extended as well as the responsibility of roles adapted to the context of respective group. The most important differences in between the case companies are summarized at the end of this section.

**Key roles**

(1) Program management was responsible for advocating Lean IT in the IT department and steering its overall implementation. Program management consisted of two primary roles: a program sponsor, who strategically supported implementation by, for example, setting objectives, allocating budgets, and communicating regularly on program progress; and a program manager, who was operatively responsible for implementation by, for instance, guiding the core implementation team, ensuring progress, assuring quality, and determining program design and adaptions.

(2) Participants were responsible for implementing Lean IT within their specific groups. We identified two primary roles: group leaders, who steered implementation in an organizational unit (i.e., group), were seen as management representatives by employees, and were part of the top-down strategy of change; and group experts, who supported group leaders with group-specific knowledge by, for instance, accessing appropriate data sources for analyses or estimating which Lean IT tools would suit the purposes of a group best. Seen as being another team member by groups' employees, group experts were part of the bottom-up strategy of change and acted as agents of change within groups.

(3) The core implementation team was responsible for the operational side of implementation and implemented Lean IT's philosophy, principles, and tools. Its chief role was that of a navigator - that is, a company-internal employee educated in Lean IT. Each core implementation team had numerous navigators, who were directly involved in implementing a specific group and supported group leaders in implementing Lean IT by conducting analyses and quality assurance evaluations, answering questions, and adapting Lean IT tools to best support the groups' internal implementation objectives. In a broader sense, navigators bridged contact among program management, group leaders, and group experts.

**Implementation phases**

Both companies segmented the implementation of Lean IT into waves, each of which took 3–4 months and contained several organizational groups. Each group belonging to a wave passed four implementation phases: preparation, analysis, design, and execution. A fifth phase - sustainability - began after the end of the wave. Fig. 2 describes the five phases of the Lean IT wave and their durations.

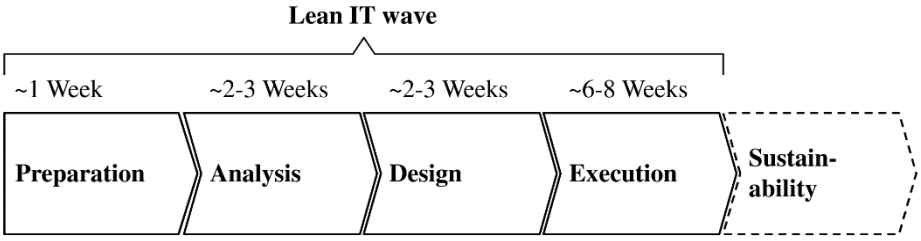


Fig. 2. Implementation phases of a Lean IT wave

(1) *Preparation (~1 week)*: All roles were involved in preparation phase. The program sponsor, program manager, and navigators introduced all group participants to Lean IT and provided an overview of the upcoming implementation phases. During this phase, expectations and responsibilities were communicated, and support was offered. All roles and group participants familiarized themselves with each other and had the opportunity to build initial relationships.

(2) *Analysis (~2–3 weeks)*: During analysis phase, group employees were exposed to Lean IT for the first time. Navigators, group leaders, and group experts analyzed the current state of the group, and through workshops, group employees became actively involved or at least continuously informed about results. Employees could identify problematic areas at any time, through navigators, group leaders, group experts, or an anonymous channel. At the end of analysis phase, a list of the group's problematic areas was created.

(3) *Design (~2–3 weeks)*: During design phase, ideas for mitigating the previously identified problematic areas were articulated. To increase acceptance, employees were asked to generate as many ideas for improvement as possible by themselves. Navigators supported this effort and provided an outsider perspective, since they were educated in Lean IT, but did not necessarily know the group's work in detail.

(4) *Execution (~6–8 weeks)*: During execution phase, ideas for improvement were executed and, if necessary, refined. Navigators supported this effort in the case of questions and assured quality. Group leaders acted as role models and adapted the new way of working into their own tasks. They also empowered employees to take responsibility for the execution of ideas for improvement and actively supported them by coaching or helping to remove organizational barriers. Group experts continued to create a positive atmosphere and used their knowledge to support their peers.

(5) *Sustainability*: The focus of this phase was to ensure that the new way of working was implemented sustainably instead of only temporarily. After the Lean IT implementation wave ended, navigators returned to their groups regularly

and answered questions openly or provided support. Regular meetings of group leaders, the program manager, and program sponsor additionally helped to maintain the focus on sustainability.

**Differences between case companies**

While both companies followed the same general implementation setup, three main differences existed related to the (1) Level of recent reorganization, (2) Integration of external employees, and (3) Involvement of the worker's council.

(1) *Level of recent reorganization:* The level of recent reorganizations was higher in Company A than in Company B. As a main consequence, in affected groups Company A needed less time for the analysis phase and more time for the design phase as not all processes have been in place yet. Consequently, the design phase was rather used as a "greenfield" planning of new processes than for mitigating existing problems. In addition, since the employees partly did not know each other well, the implementation of Lean IT was also seen as a way to get to know each other better.

(2) *Integration of external employees:* Another difference were the contract-types used for vendors. While Company B used more fixed-price contracts, Company A used more time-and-material-based contracts. This resulted in a situation in which company B did not have manifold opportunity to include external employees in their implementation, while this was easier for Company A (however, for financial reasons only long-term external employees were included).

(3) *Involvement of the worker's council:* As in Company B the worker's council had experienced a Lean Management implementation in the past (production department) they already knew some basic concepts of what to expect. In Company A it took considerably more effort to convince the worker's council of the Lean IT implementation activities.

However, while these differences are considerable, they did not affect the change management approach (see next section) significantly.

### *4.2 Interpretation*

In the following section, we reflect on the case study results in light of the two previously introduced CM perspectives in order to identify lessons learned for a Lean IT-specific CM approach, as illustrated in Fig. 3.

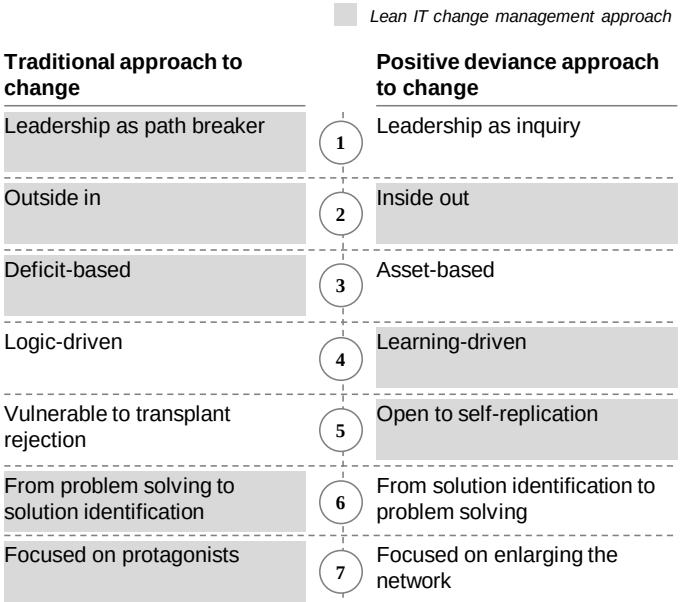


Fig. 3. Lean IT change management approach

**Leadership as path breaker vs. leadership as inquiry**

The implementation of Lean IT is driven top-down, which means that leadership needs to act as path breaker. The program sponsor, program manager, and group leaders decided on the implementation start date and took responsibility for the success of implementation. However, implementation setup gave employees the freedom of choice (e.g., to identify and prioritize problematic areas, propose improvement ideas, take responsibility for solving a problem, and to budget time in order to drive an improvement project), which also gave them leeway to reflect the bottom-up aspect of change. Nevertheless, while Lean IT aims to achieve behavioral and attitudinal change in the long term, that goal requires a considerable mind-set shift of both leadership and employees. Since we expected this shift to take more time than the timeframe planned for an implementation wave (i.e., 3–4 months), we viewed leadership as playing the chief role in driving change. As a group leader expressed, "As a leader, you need not only to show that you're positive toward it [Lean IT]… You need to show that you think it's fantastic. If you don't show to the group from the very beginning that you'll hold on to the Lean IT implementation no matter what comes…, then the employees will forever look for evidence that it doesn't work." (Company A)

**Outside in vs. inside out**

Both of these CM characteristics are equally important for implementing Lean IT. On the one hand, Lean IT, in terms of philosophy, principles, and tools, and its effects on the daily work of a group constitute an outside-in intervention. On the other, the group primarily suggested improvement ideas - that is, from the inside out. However, both CM characteristics required strong commitment from the group leaders. Regarding newly implemented Lean IT tools, they acted as role models and continuously engaged the groups, together with the navigators, to adhere to their appropriate application. Regarding improvement efforts, they motivated their subordinates to execute improvement activities and supported them while doing so (e.g., with project management guidance, the removal of organizational barriers, and the provision of time). As one group leader put it, "A board member told me, 'That's a superb result [of the first wave]. You've already defined many measurements that now can be rolled out to all groups [within the IT department].' I replied, 'No! That would be the biggest mistake we could make, since it would be a top-down approach all over again. That won't work… since the employees won't accept it… Let the employees develop their improvement ideas by themselves.'" (Company A)

**Deficit-based vs. asset-based**

Deficit-based CM characteristics are more appropriate for implementing Lean IT than the asset-based strategy. The analysis phase especially indicated this aspect by showing how group leaders, group experts, and navigators analyzed the current situation of their groups thoroughly. Thereby, the identification of problematic areas usually also involved peer-to-peer comparisons that asked why the group's performance was different from that of other groups or competitors in order to understand the magnitude of the respective problematic area. However, some elements of the asset-based CM characteristic could be observed as well, since Lean IT implementation also focused on the internal sharing of best practices. For example, in the case of high variability in employee performance, standard operating procedures (SOPs) were implemented, and adherence to the SOPs was checked regularly by the group leaders. In the case of deviation, either the SOP was adapted (i.e., positive deviation) or the employee was asked to adapt to the SOP (i.e., negative deviation). Although independently learning from peers is part of asset-based CM, such was not the case in reality because the group leaders actively steered the learning process - for example, when using a systematic skill-building approach. As one navigator attested, "In analysis, the as-is status is made unsparingly transparent, and it is identified where exactly challenges are and where improvement potential exists… In the next step, during design, the measurements that really help need to be reflected in detail in order to create a target status." (Company B)

**Logic-driven vs. learning-driven change**

Learning-driven change was the predominant CM characteristic used in the cases of Lean IT implementation. Especially during the execution phase, the previously identified ideas for improvement were realized by using a trial-and-error approach. If an idea did not work as expected, then the group changed it and tried again. Moreover, navigators continuously tried to convince the group employees to apply Lean IT tools - at least for a certain timeframe - in order for the group to have the opportunity to experience that the tools could benefit their daily work. As a navigator put it, "It's very important that the group leader really supports it [Lean IT] and consequently says, 'This is what we will try out now'… There were also [implementation] steps when the group leader said, 'We do it like this,' and then we realized, maybe 2 weeks later, that if one went only half of that way it would have been sufficient." (Company B)

**Vulnerable to transplant rejection vs. open to self-replication**

Lean IT uses a CM approach open to self-replication. As soon as the initial employees were convinced that Lean IT could actually benefit their daily work, they acted as multipliers of change and created a pull in IT departments in a way that other groups and employees also became interested in implementing Lean IT. The program sponsor and program manager supported this pull by organizing talks and roadshows and inviting interested group leaders and employees to experience the results and testimonials of Lean IT via those change multipliers. As a program manager put it, "At some stage during the last steering committee meeting, an employee made an introductory statement regarding Lean IT and why he believes in it and why it's a good program. From that moment on, our board [members other than the program sponsor] was hooked." (Company A)

Although one of the companies was already using Lean Management in manufacturing, self-replication occurred only within the IT department. Since experience with Lean IT principles in other parts of the business did not create the described pull mechanism, we suggest that self-replication probably works only within the same community of practice.

**From problem solving to solution identification vs. from solution identification to problem solving**

Lean IT proposes a CM approach from problem solving to solution identification. The order of the implementation phases demonstrated this dynamic since the analysis phase (i.e., the identification of problematic areas) was followed by the design phase (i.e., the identification of ideas for improvement). In general, Lean IT focuses on the optimization of several smaller problems instead of on finding innovative solutions for greater problems. However, that dynamic does not mean that Lean IT necessarily hinders innovation in general. For example, both companies implemented Lean IT because they wanted to deliver more projects with an innovative focus (i.e., digitization) for the business. In both cases, Lean IT aimed to support innovation by freeing up resources by increasing efficiency and using those resources deliberately for an innovative cause. As a department leader reported, "What I personally liked a lot… was the breadth applied during analysis… since it shed light on many facets… That's indeed a holistic reflection of what we have here in our environment, and it was useful in order to set the direction of impact for later [subsequent phases of the wave]." (Company B)

**Focused on protagonists vs. focused on enlarging the network**

Since the implementation of Lean IT began at the group level of IT departments, the initial focus was self-optimization within the respective groups. Therefore, improvement ideas primarily involved known protagonists. However, we argue that after the initial period of self-optimization, overarching problems might call for broader solutions with new protagonists, which can include other groups (e.g., in interdependencies within daily work), customers, or suppliers. As one program manager stated, "Lean IT is a about capacity building… Inspire the employees to self-organize efficiently without changing the overarching process… Organize yourself [the employees] around it: that is the main difference… If employees understand this and self-optimize sustainably, then we [the organization] have won." (Company A)

## 5. Conclusion and outlook

Based on the observation of both companies, we proposed and discussed CM lessons learned to facilitate Lean IT implementations. In that sense, we have outlined seven characteristics of a respective CM approach (Fig. 3).

Our paper contributes to the IS body of knowledge in several ways. From an academic perspective, to the best of our knowledge, we have conducted the first empirical investigation of a CM approach for Lean IT implementations. Our synthesis of lessons learned in the applied CM framework can support the construction and extension of theoretical perspectives for future investigations. For practitioners, we have offered applicable and comprehensible information that can serve as a starting point for future Lean IT implementations. Moreover, since the CM approach reflects the observation of two case companies, the information provided can also help practitioners to reflect on their ongoing Lean IT implementations and to optimize the implementation setup or CM approach in their own organizations.

The main limitation of our paper is its restriction to two case companies. Although we consider the research approach and results to be robust, a broadening of the investigation to include additional cases would help to strengthen the validity and generalizability of the results. Having used two contrasting cases with respect to experience in Lean Production did not demonstrate any significant differences. Thus, further differentiation regarding prior Lean experiences in other domains will probably not yield any valuable replication logic. However, looking at different industries, especially those where the IT department's role differs fundamentally, might prove useful nevertheless.

Future research could extend the investigations in our paper in two ways. First, we did not explicitly address or define the aspect of success in terms of a successful Lean IT implementation, primarily because implementation was ongoing as we conducted our study. As such, we relied on statements of interviewees that confirmed that the implementation had so far been perceived as having succeeded. Future research could aim to conceptualize perceived success regarding Lean IT implementations more clearly and quantify the results of respective CM approaches. Second, we expect that the application of a different research methodology might provide additional insights. In that sense, future research could investigate the research questions at hand in a quantitative research setting.

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**Abstract:**
Digitalization has been identified as one of the major trends changing society and business. Digitalization causes changes for companies due to the adoption of digital technologies in the organization or in the operation environment. This paper discusses digitalization from the viewpoint of diverse case studies carried out to collect data from several companies, and a literature study to complement the data. This paper describes the first version of the digital transformation model, derived from synthesis of these industrial cases, explaining a starting point for a systematic approach to tackle digital transformation. The model is aimed to help companies systematically handle the changes associated with digitalization. The model consists of four main steps, starting with positioning the company in digitalization and defining goals for the company, and then analyzing the company's current state with respect to digitalization goals. Next, a roadmap for reaching the goals is defined and implemented in the company. These steps are iterative and can be repeated several times. Although company situations vary, these steps will help to systematically approach digitalization and to take the steps necessary to benefit from it.

**Keywords:**
digitalization; digital transformation; systematic change; case studies; transformation method.

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## 1. Introduction

Digitalization has been identified as one of the major trends changing society and business in the near and long term future [1]. The impact of digitalization will be major; it has been compared to the industrial revolution by several authors [2]-[5]. In this paper, digitalization is referred to as a more fundamental change than just digitizing existing processes or work products. The term digitization refers to "the action or process of digitizing; the conversion of analogue data (esp. in later use images, video, and text) into digital form." According to literature, digitalization, or digital transformation, refers to "the changes associated with the application of digital technology in all aspects of human society" [6]. Digitalization is also known as the "ability to turn existing products or services into digital variants, and thus offer advantages over tangible product" [7],[8]. According to Brennen and Kreiss [9] digitalization refers to "the adoption or increase in use of digital or computer technology by an organization, industry, country, etc." The Finnish Tax Administration exemplifies the difference of digitizing and digitalization in the taxing of citizens; if the Tax Administration would have digitized their process, they would have implemented the tax reporting form as a digital form instead of a paper form and enabled attaching receipts and certificates in an electronic format as well. Instead, the Tax Administration renewed the entire process so that the tax authority electronically receives tax information directly from employers, banks, and other income sources of citizens, then the Tax Administration sends taxing proposal form to the citizens. If the proposal is correct, the citizen does not need to do anything.

Based on previously introduced definitions, digital transformation is defined as changes in ways of working, roles, and business offering caused by adoption of digital technologies in an organization, or in the operation environment of the organization. This refers to changes at several levels, including the following:

- *Process level*: adopting new digital tools and streamlining processes by reducing manual steps;
- *Organization level*: offering new services and discarding obsolete practices and offering existing services in new ways;
- *Business domain level*: changing roles and value chains in ecosystems;
- *Society level*: changing society structures (e.g., type of work, means of influencing decision making).

This paper focuses on the first three levels: the process, organization and business domain levels of digitalization and especially on how companies can tackle the change and benefit from it.

The potential benefits of digitalization are high; already by digitizing information-intensive processes, costs can be cut by up to 90 percent and turnaround times improved by several orders of magnitude. In addition, replacing paper and manual processes with software allows businesses to automatically collect data that can be mined to better understand process performance, cost drivers, and causes of risk. Real-time reports and dashboards on digital-process performance permit managers to address problems before they become critical [10.] According to Sabbagh et al. [11] digitalization offers incremental economic growth; countries at the most advanced stage of digitalization derive 20 percent more in economic benefits than those at the initial stage. Digitalization has a proven impact on reducing unemployment, improving quality of life, and boosting citizen access to public services. Finally, digitalization allows governments to operate with greater transparency and efficiency.

Even though the importance of digitalization is well known, companies are often struggling to understand the potential impact and benefits of digitalization. In practice, there are many obstacles to digital transformation. According to Henriette et al. [8], a digital transformation project involves implementing digital capabilities to support business model transformations impacting entire organizations, especially operational processes, resources, internal and external users. This is a major change in habits and ways of working, which is based on collaboration and intensive interactions. The Digital Business Global Executive Study and research project from 2015 [12] by MIT Sloan Management Review and Deloitte focused on more than 4800 business executives, managers and analysts from organizations around the world and how they saw the digitalization in their company. This study found that 76% of respondents felt that digital technologies are important to their organizations, and 92% believed that digitalization would be important in three years. Additionally, 60% of respondents mentioned that digital technologies would have the potential to fundamentally

transform the way people in their organization worked, and 76% saw that digital technologies would disrupt their industry greatly or moderately in the near future. The research further asked how the participants saw their company maturing for the digital transformation. The results show that 26% of the responding companies found themselves in the early stages of maturity in digitalization, 45% considered their company to be developing, and 29% of the respondents considered themselves to be mature companies in terms of digitalization. Mature companies typically had a clear digital strategy combined with a collaborative culture and leadership that was driving the transformation and encouraged risk taking. However, in many companies, failed implementation of enterprise resource planning was common, many times due to previous generations' knowledge management systems. The transformation did not succeed because organizations did not change mindsets and processes or build a culture that could foster the change. Lack of an overall digitalization strategy and competing priorities were the most typical obstacles for digitalization, together with security concerns and insufficient technical skills.

As introduced before, digitalization affects many aspects of organizations, including information technology, strategy and business models, products and services, internal and external processes, organization and company culture, etc. In this paper, the phenomenon of digitalization, especially digital transformation, is discussed from viewpoints of literature and experiences gathered from case studies. Finally, the produced synthesis - a model of conceptual framework - is introduced and discussed.

This paper is constructed as follows: first, we will introduce main observations based on literature reviews. After that, in section 3, research design with selected research methods are introduced. In section 4, case studies utilized in results' synthesis phase are described, and in section 5, the main result, a conceptual model of the framework, is presented in details. Finally, in section 6, research limitations and further research is discussed with the conclusion explaining the main research results.

## 2. Related work

In this paper, digital transformation is understood to induce a broad spectrum of changes in all human society areas [6]. However, there is very little scientific research published on digital transformation, as most published work is related to digitizing information, not the transformation of an organization or the ability to use digital means in the organization. Similar conclusions were reached in a systematic literature review carried out by Henriette et al. [8]. Their review showed that most existing papers regarding digitalization dealt with technological innovations (e.g., mobile technologies, analytics solutions), even though digitalization actually covers a wider scope. Furthermore, this study also identified a lack of research regarding the realization of digital transformation projects, i.e., research on how to manage a digital transformation and how to identify and manage the costs of this transformation.

A systematic literature review on digital transformation is currently being completed by the authors. According to results of this review, the pace of scientific publishing related to digital transformation is increasing, but literature on the topic still remains scattered and focuses predominantly on technological or other relatively narrow aspects of digitalization, often in the context of specific sectors such as healthcare, transportation, education, retail, manufacturing, smart cities, or public services and e-government (e.g., [13],[14]). A number of publications examine, often through case studies involving specific companies or regions, the digitalization-induced disruptive changes that have affected the business models, consumption, and audiences in media and music industries in which digital transformations started relatively early (e.g., [15],[16]).

Digital strategies and organizational changes needed in industries seeking to successfully execute digital transformations are discussed in a number of publications, again typically via case studies (e.g., [17],[18]) incorporating concepts, such as innovation capacity, capability frameworks, organizational ambidexterity, and digital maturity models, which link business processes and organizational cultures to exploitation of digital technologies (e.g., [19]). Recent works have called for wider perspectives, considered fundamental paradigm shifts and societal impacts in wider contexts, and outlined more comprehensive approaches and frameworks for treating digital transformation, either in specific industries or business functions (e.g.,[20]-[22]), or more generally, across different industries or sectors of

society (e.g., [23]), seeking to understand and support flexible transformation of business processes, information systems, and societies. Other efforts focus on identifying gaps in understanding and scientific knowledge that stand in the way of successful digital transformations (e.g., [24]) and identifying traits of effective digital enterprise [25].

Digitalization is currently a hot topic in non-scientific publications; there are many white papers, reports and blog writings available on the topic. Also, consulting companies are creating services to help companies in their digital transformation. However, these sources are usually based on opinions and speculations, and thus it is difficult for companies to know how reliable and suitable for their situation the information is.

## 3. Research design

### *3.1 Impact of digitalization*

As pointed out, digitalization is already impacting business environments and the corporate way of working. Neglecting digitalization could create a risk of losing the game in the highly competitive markets. Digitalization can impact a company's entire operation environment and internal functioning. Digitalization can also bring new business opportunities, change the roles of operators in a value chain, and end existing business. For example, digitalization may remove traditional intermediates in the supply chain and create new intermediates. This can be due to, for example, direct access to consumers and the increased use of mobile devices.

Thus, the impact of digitalization, and the goals of digitalization for an organization, can be identified from three different viewpoints:

1. *Internal efficiency*; i.e., improved way of working via digital means and re-planning internal processes;
2. *External opportunities*, i.e., new business opportunities in existing business domain (new services, new customers etc.);
3. *Disruptive change*; digitalization causes changes business roles completely.

These three impact viewpoints of digitalization can be presented as shown in Fig. 1.

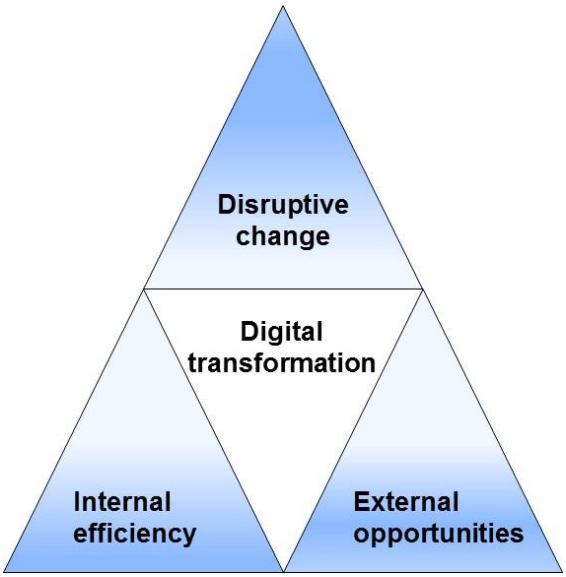


Fig. 1. Digitalization impact

The potential benefits of digitalization *for internal efficiency* include improved business process efficiency, quality, and consistency via eliminating manual steps and gaining better accuracy. Digitalization can also enable a better real time view on operation and results, by integrating structured and unstructured data, providing better views on organization data, and integrating data from other sources. Furthermore, digitalization can lead to better work satisfaction for employees through automation of routine work, thus freeing time to develop new skills. Digitalization also improves compliance via standardization of records and improves recovery via easier backups and distribution of storage.

*External opportunities* include improved response time and client service, as well as possibilities for new ways of doing business. New digital technologies can create opportunities for new services or advanced offerings to customers.

*Disruptive changes* involve changes in the operating environment of the company caused by digitalization; for example, a company's current business may become obsolete in the changed situation (e.g., manual scanning of invoices replaced by electronic invoice). On the other hand, digitalization can create completely new business, such as inclusion of an e-invoice operator, for example.

### *3.2 Research methods*

Digital transformation is a new and often misunderstood phenomenon. A case study research approach [26] was used to better understanding of digital transformation, as case studies often examine complex and not repeatable circumstances and, in this way, gather information for the creation of new knowledge [27]. Furthermore, the Grounded Theory [28] has been applied to analyze collected data and to develop theory from the data.

This paper provides evidence from various case studies. There were several industrial cases involved the research projects, such as, PROMES ITEA 3 project (2014-2016, URL: https://itea3.org/project/promes.html), DIGILE Internet of Things - programme (2014-2016, URL: http://www.internetofthings.fi/index.html), TINTTI project (2015-2017, URL: http://www.oulu.fi/oulubusinessschool/node/41286), DIMECC N4S program (2014-2016, URL: http://www.n4s.fi/en/) and DICI project (Competitiveness from digitalisation in clothing industry, 2016-2018). The phenomenon of digital transformation was approached according to grounded theory with questions of "*What's going on with or via digitalization in the company?*" and "*What is the main problem/improvement target; and how those are trying to be solved?*" For providing synthesis of observations, case studies were described formally, including descriptions of "Drivers and impact", "Current state", and "Approach", as introduced in section 4. Our hypothesis was that some clear drivers or impact goals of digitalization accelerate change(s).

Several case studies were carried out to collect data from several companies during years 2014 - 2016 (in several projects as described above), and a literature study was carried out to complement the data during the second half of 2016. However, the literature study revealed that there is not much literature on digital transformation as we defined it. Thus, we relied mostly on case study data. Multiple case studies are needed due to diversity of both the phenomenon and the subjects (companies and their situations). The case studies were diverse and thus not structured similarly, as we wanted to gain information as widely as possible. The gathered data was sorted and synthesized through qualitative coding related to different aspects of digital transformation. Thus, we were able to identify patterns in the case study data. The model for digital transformation was built based on the analysis of the patterns. The four case studies are described in section 4 and the patterns are included in section 5.

## 4. Reflecting digitalization via case studies

Recently, challenges to benefit from digitalization in practice have been increasingly discussed among companies. In this section, four examples from the case studies are introduced to provide understanding of the phenomenon and the research context. The cases are from companies that we have been collaborating with in research projects as described in section 3.2, and that have been experiencing digitalization and changes caused by it.

### *4.1 Automation systems provider and the digitalization of service processes*

In this case, a company that produces automation systems is moving towards service business that has been seen as a trend in their business environment. Company aims to utilize the possibilities of digitalization to improve their service processes as well as to collaborate better with organizational units and customers.

*Drivers and impact:* The main driver for a company to take on service business is that business can increase. Therefore, service processes need to be digitalized in order to improve the efficiency of operation and surviving in global competition so that more money comes from services rather than product sales.

From a technological point of view, the technical deterioration (technology, commercial-off-the-shelf (COTS) - components, standards, etc.) of older automation systems is an industry problem. It has been estimated that the value of the worldwide installed base of automation systems reaching the end of their useful lives is approximately 65 billion dollars [29]. The reliability of technical systems will decrease over time if companies ignore industrial services; in fact, "for a typical automation/IT (information technology) system, only 20-40 percent of the investment is actually spent on purchasing the system; the other 60-80 percent goes towards maintaining high availability and adjusting the system to changing needs during its life span" [30]. One key service business process affected by this situation is an upgrade service, which is used to keep the customer's automation system up-to-date by upgrading it based on a jointly (customer – provider) agreed plan. Therefore, in the best case, a process such as upgrade service provides a stable income stream for the automation system vendor. Since services are implemented in close collaboration with customers, it is important to better understand individual customer service needs to detect business potentials related to a customer's personal automation system. Therefore, knowing the status of the customer's automation system through its lifecycle is the basis for industrial services.

*Current state:* Automation system vendors have upgrade or evolution programs that aim to systematically and controllably evolutionize installed automation systems. These vendors seek to protect their customer base and prevent a situation in which the installed system reaches a point where a major investment in their automation plant is the only way to ensure its survival. Instead, automation system vendors provide a cost-effective path for a customer automation systems to evolve through a series of small and manageable steps in order to meet changing needs.

The upgrade process starts with identification of upgrade needs, and then the customer's automation system configuration needs to be identified. The InstalledBase tool was used to identify this information, even though the coverage and usability of the tool was sub-par. Upgrade opportunities and impacts need to be analyzed based on automation system configuration and life cycle rules (rules that indicate the life cycle constraints and possibilities for different components and technologies). These rules impose a complicated dependency matrix between components and technologies. Finally, based on analysis, the lifecycle plan will be manually created and it will be modified together with the customer by taking into account schedules and budgets. Furthermore, the company has an extranet solution for exchanging information with the customer, but it does not provide more advanced communication and collaboration functions.

*Approach:* The target was to improve the Upgrade process with digitalization. The best possibility for improvement was estimated to be the InstalledBase tool. Other improvement items were life cycle rules, lifecycle plans and customer extranet for online customer collaboration. Since the easy to use InstalledBase tool with respectable coverage is the basis for all industrial services, the company selected it as a top priority improvement action. With up-to-date installation information, it is possible to provide more accurate and intimate services for customers. The customer extranet tool was prioritized as a solution that will be implemented later on. Furthermore, the automation of the creation of the lifecycle plan was studied since the creation of this plan is quite time-consuming. However, it became obvious that there needs to be flexibility in the creation of the plan. Therefore, the company ended up with a semi-automatic solution wherein the user could export the preliminary plan from the tool and then modify it based on negotiations (budget, schedules) with the customer. The future plan includes the development of a customer extranet tool, which will be a more sophisticated medium for vendors and customers to exchange lifecycle plans, comments, notifications, feedback and other material related to the configuration of the customer's automation system.

### *4.2 Energy utilities*

This case focused on the technological needs created for electric utilities towards making a better use of smart metering and other smart grid data. The focus was not on single company, but the electric utility domain as a whole.

*Drivers and impact:* The changes caused by digitalization, i.e., digitalization drivers, were seen to be technological developments, such as emergence of electric cars, and the smart meters, changes in the operational environment such as the increasing number of micro producers (e.g., utilizing solar power, or wind energy), and regulatory aspects relating to tariffs, etc. These changes were seen as causing potential changes on the energy utilities business and operating environment. The impact of these changes could be related to the requirements of the electricity network, balance management, and pricing mechanisms.

*Current state:* In their current state, the electricity grids aim to provide a constant unidirectional flow of energy to their customers and to gain knowledge of the end user's energy consumption via a unidirectional data flow from the energy meter. Consequently, the communication infrastructure related to electricity grids is very rigid and asymmetric by its nature. In order to enable the essential features of a Smart Grid, i.e. flexible switching of energy flows and real time interaction between the energy provider and the consumer, a truly interconnected architecture of electricity grids and communication networks is required. Moreover, in order to guarantee the delivery of energy under special circumstances, e.g. grid or network fault situations, there must be more than one route through which the control and monitoring data can be exchanged.

*Approach:* Storing and analyzing this data provides significant potential for utilities to improve the use of their network, to plan their investments better, and to have more accurate information on which to base their pricing. Of particular interest was increasing the knowledge of consumer and industrial use of electricity, which offers great potential benefits for utilities, especially when combined with demand side load management.

### *4.3 Virtual factory*

This case dealt with a company producing embedded software systems in Electronic Manufacturing Service (EMS) partners. The case company deals with highly regulated product domain solutions tailored to B2B (business to business) customers. Delivered products share a common technology platform but include a wide range of features targeting individual customer needs.

*Drivers and impact:* The drivers for digitalization came from the business environment which required fast adaptation to customer specific needs, as well as customer intimacy, but at the same time even better efficiency, reliability and advanced technological competence in the fast changing domain area. Also, the need for using supply chains and the increasing need for product maintenance, along with decreasing the amount of human resources were the drivers for digitalization. To ensure that customer special needs were taken into account, close interaction between customer, company, and partners throughout the design and delivery process was required. However, there were blind moments in the delivery process, especially while the products were being manufactured at the EMS partner.

*Current state:* The case company had already improved the transparency of the delivery process to stakeholders by using shared tools and dashboards for monitoring project activities and performance in real time. However, visibility and level of digitalization in the processes that spanned over the supply chains and EMS partners was still low. Specifically manufacturing still included several manual steps in the form of specifications, status reports, quality control, etc. This step of the delivery process was a black box type of solution, which started from delivering specifications to the EMS partner and then getting the device back after manufacturing. The goal of digitalization was to improve the company delivery process by making it less risky regarding false release estimations and poor product quality. By starting the process of digitalizing their manufacturing in the delivery process, the target was to build capabilities to monitor and measure the manufacturing process in real time, and that way to find reasons for complicated quality problems and identify risks before they turned into issues, as well as to support maintenance activities.

*Approach:* By establishing digital and transparent methods, the company has defined important data that they want to collect from the manufacturing process in the supplier chain. This data involves important measurements regarding functional performance and quality of the manufactured devices and manufacturing process data. Data collected in the manufacturing process were connected to the other data sources of the company in the data warehouse. Combining master data, different data sources, and measurements across various processes impacted overall quality control positively, as well as performance monitoring, product lifecycle management and overall customer satisfaction in regard to delivered products. By creating a virtual factory solution, the company could monitor the feature performance and process of manufacturing in real time but also give better estimations for future delivery processes. The solution also gave the company better methods to control the manufacturing process and prepare for risks, change their EMS partners, update the test software with little time, and protect their IPR (intellectual property rights) better at the EMS partner.

### *4.4 After sales IT system provider utilizing industrial internet*

Case company Absent Oy (http://www.absent.fi/en/) provides IT systems related to the different post manufacturing and after sales operations, such as sales configurators, customer support systems, etc. They aim to extend their offering with real-time continuous monitoring and analysis solutions that can be used, as an example, for predictive maintenance services.

*Drivers and impact:* The driver for digitalization was the recognition of business potential of Industrial Internet (II). Technology and II solutions. The prices of the components related to these solutions (e.g. sensors) are cheaper, and the awareness of digitalization and II is spreading across the industry. Furthermore, the need for new industrial service business and the rationalization of service business processes is emerging among industrial customers in order to survive in international competition.

*Current state:* The case company began developing solutions that manufacturing companies can use to provide new data-based service for their customers, e.g. predictive maintenance. This is not possible without applying II technology for data collection, monitoring, transfer, and analysis. II enables cost-efficient solutions for this.

The case company provides different kinds of after sales IT systems that help manufacturing companies and their partners in maintenance, reselling and warranty operations, as examples. So far, the bottleneck in this offering has been the lack of the data monitoring and analysis solution that can be used to collect and analyze data from the machines and equipment while they are in use in end user premises.

*Approach:* The case company has the roadmap for the solution implementation and production. The steps include the implementation, piloting, and production of the solution, and in parallel with the technical implementation, the business planning is ongoing. The case company aims to pilot the solution in its customer companies of different domains and investigate the potential of this solution in them. The case company implemented the new solution and gained the ability to integrate it with their customers' existing IT systems. A data collection bundle takes care of data collection, pre-analysis, and data transmission to data analysis services. Data analysis service signals are based on the rules that have been selected from algorithm database, through which a variety of services can be triggered in response to the data collected in the field. A data collection bundle with an analysis service can be used as a stand-alone solution, or the company can integrate it with its other IT system offerings. Integration with AfterSales IT system, for example, enables sophisticated lifecycle management and services for the whole fleet of equipment/machines.

## 5. Model for tackling digitalization in companies

The importance of digitalization is becoming understood, but the question now is how to do it in practice in order to best benefit from it. As a synthesis of gathered feedback and experiences from the case companies, a conceptual framework was created. The main goal of the framework is to provide a comprehensive model for supporting organizations in their digital transformation. The framework is intended to be general at this level so that it fits in

different situations. The framework needs to be detailed when more understanding of different situations is gained. In this section, the conceptual framework, a model for tackling digital transformation, is introduced.

The model focuses on tackling digital transformation in a company, as illustrated in the following figure (Fig. 2). The model follows commonly known plan-do-check-act principles [32] for improvement at a high level.

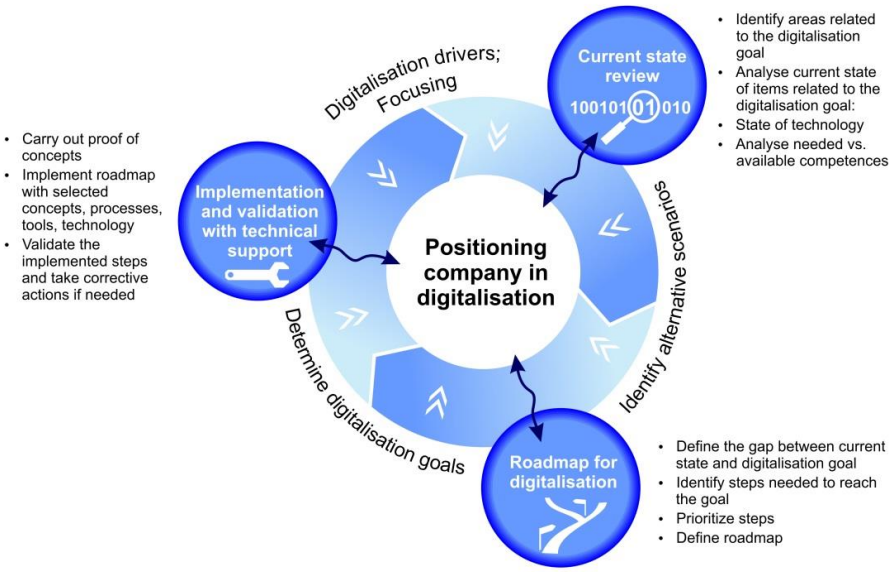


Fig. 2. Model for tackling digital transformation

The first step is to analyze the potential impact of digitalization for the company and decide on the position that the company wants or needs to take in the change. The second step is to review the current state of the company with respect to the desired position and the impact of digitalization, as well as to identify the gap between the current situation and the wanted future. The third step defines the approach that needs to be taken to close the gap from the organization's current state to the desired position and defines the concrete actions needed to reach the desired position. The fourth step is about implementing and validating the actions and returning to previous steps if needed. The model is used iteratively to gradually build the solution and fine-tune digitalization goals and plans, if needed. Next, each of these steps is discussed in more detail.

### *5.1 Positioning a company in digitalization*

This step is divided into four sub-steps: digitalization impacts, digitalization drivers, digitalization scenarios, and digitalization goals. In order to define the position of the company, the digitalization impacts for the company should be analyzed first through identifying and analyzing current and upcoming trends of digitalization and the relevance of these trends to the company's business domain. Also, how far the business domain already is in adopting these trends should be analyzed. The trends can be categorized using SWOT (strength-weakness-opportunity-threat) analysis into topics that are strengths or weaknesses or can create opportunities or present threats in the business domain. This analysis sets the basis for positioning the company in digitalization.

Next, digitalization drivers should be identified for the company using the trend analysis results. This is done by looking at the relevant trends for the business domain and analyzing impact on the company. The importance of each of

these drivers should be defined in order to scale the next steps. For example, if it seems possible that the current business of the company will become obsolete without changes (e.g., due to new actors in the market that have invented a new business model), also the actions that are taken to avoid this, should be radical.

Based on the driver analysis, potential scenarios for the company's future should be analyzed for the most important drivers. This is done in order to understand the potential impact of the company's digitalization. As discussed in section 3.1, these impacts can be related to internal efficiency or external opportunities, but they can also be disruptive. Alternative scenarios for digitalization are identified and analyzed. This analysis involves evaluating the cost of implementing the scenario, benefits of implementing the scenario, and risks involved in both implementing and not implementing the scenario. Based on the scenario analysis, the best alternatives are chosen for the company.

The final task is to define the goals of the company's digitalization process by analyzing the selected scenarios and their feasibility for the company. These goals can differ in various situations depending on the potential impact of digitalization for the company. For example, the goal can be as narrow as utilizing a technology for faster operations or as broad as a complete renewal of business. When goals are defined, they should formulate to business related indicators through which improvements can be evaluated against the baseline situation and further improvements can be conveyed. The digital transformation is not a one-time-exercise in a company; instead, it is a continuous adaptation and streamlining to meet the changing demands of the business environment.

The result of this step is pinpointing the goals for a company's digital transformation.

### *5.2 Review of the current state*

In this step, the current situation of the company is analyzed from the viewpoint of the defined goals. This step is divided into two sub-steps, which include analyzing impacted areas and analyzing the situation with respect to the goals. First, the impacted areas, or the issues related to the goal, are identified are analyzed. In case the goal is related to internal efficiency, the related processes, tools and resources are identified (these more detailed elements of the areas are called as issues). If the goal is related to external opportunities, customers, competitors, and external resources and processes are identified. If the goal is related to disruptive change, it is likely that all of the company is impacted.

After the impacted areas are identified, their situation in respect to the goal is analyzed. The questions to be answered vary based on the goal. If the goal is internal efficiency, the questions relate to the currently used practices—for example:

- How is the issue handled now, and how satisfied are the stakeholders with the current situation?
- What is the state of technology used to handle the issues?
- What main bottlenecks exist in the current practice?
- What current competencies related to the goal are available?
- What are restrictions for change relating to the issue?

In case the goal is related to external opportunities, questions are related to the business case, including, for example:

- What are the current company offerings?
- Who are the current customers and what are the current customer segments?
- What is the competitive advantage of the current offering compared to competitor offerings?
- What are the potential new customer segments and who are the potential new customers?
- What is the current state (e.g., competitors offering) in the new segment?
- What would be the competitive advantage of the company in the new service or segment?
- What is the cost of implementing the new offering?
- What risks are involved?
- What is the impact on the company's current offering and business?
- What is the window of opportunity?

In case the goal is related to disruptive change, the following questions are related to all the company's areas:

- Which current company offerings are impacted?
- How dramatic is the impact on each offering (offering becoming totally obsolete, current customers of the offering leaving to find opportunities in other segments, etc.)?
- Which processes are involved with the change?
- What competencies and resources does the company have?
- Where can these competences be utilized in the future?
- What is the timeframe of the change?

As a result, a detailed description of the current state with respect to the digitalization goal is described.

### *5.3 Roadmap for digitalization*

In this step, the detailed plan for reaching a goal is defined. This step is divided into four sub-steps, including identifying the gap between current state and goal, planning the actions needed to close the gap, analyzing feasibility and prioritization, and creating a roadmap. First the gap between the digitalization goal and the current state is determined in detail. In case the goal is related to internal efficiency, the current state of the processes and technology used is analyzed against the goal, and desired changes are identified. In case the goal is related to external opportunities, the definition of the gap involves a definition of the work that needs to be done to develop the offering for the new customer or segment, including needed competences, development work, and possible changes in the current offering. In case the goal is related to disruptive change, the gap analysis involves defining the current issues (competences and offerings) that can be utilized in the new situation, as well as identifying missing issues.

When the gap is defined, actions to close the gap should be defined. In case of an internal efficiency-related goal, the actions can be taking on new technologies (e.g., IT tools) and optimizing an existing process or re-defining processes utilizing digital opportunities. When improving internal efficiency with digital opportunities, the current way of working should not just be digitized, but functionalities should be defined so that digital opportunities are used optimally. This analysis should consider which processes would have the highest potential to benefit from digitalization and the criticality of the processes to improving business. Key Performance Indicators (KPI) should be re-evaluated and updated to better meet new business targets. In case of external opportunities and disruptive change goals, the actions could involve defining and developing new offerings, acquiring new competences, analyzing potential new markets, and rearranging internal resources.

When actions are identified, the feasibility of these actions should be analyzed and prioritized. Feasibility analysis involves, for example, a cost-benefit analysis, an impact analysis on existing practices, offerings and resources, a risk analysis, and an analysis of constraints. Common costs of digitalization include the technology needed for digitalization, training and support for staff involved in digitization work, and maintaining the digital data. Also, as digitalization involves change, all common costs related to changing the way of working apply. Part of feasibility analysis can be trials and prototypes of the potential solutions in order to gain deeper understanding of the actions needed. Then the actions are prioritized considering dependencies between the actions and views of relevant stakeholders. Also, the organization's ability to change should be considered so that the correct pace of change can be implemented.

When the actions are prioritized, they can be arranged into an actual roadmap, defining the order, importance, and responsibilities for the actions.

### *5.4 Implementation with technical support*

This step is about implementing and validating the actions defined in the road map. It is often useful to first implement proof-of-concepts when new technical advancements are attempted. As this step is highly dependent on the goals and planned activities of previous steps, there are no generic sub-steps identified.

Digital transformation involves a change, and thus all facets of change management should be considered including: managerial disputes about the nature of advancement, a socio-cultural challenge resulting from the organizational effects on the involved people (which may lead them to react against those changes), and a technical challenge, which is due to the difficulty in understanding and adopting a new technology.

The validation of actions should analyze whether the actions lead to desired impacts, and corrective actions should be considered in case desired impacts are not met.

## 6. Conclusion

The current trends of digitalization change the environment where companies operate. In this paper, changes were considered at the process, organization and business domain levels. The changes can be new possibilities to do things more effectively or affordably, but they can also be disturbing to a company's current operations, as digitalization fundamentally changed a company's business opportunities. Digitalization is not about turning existing processes into digital versions, but rethinking current operations from new perspectives enabled by digital technology. In this paper, the phenomenon of digital transformation has been discussed in the context of case studies, and through introducing the model for tackling the change and getting most benefit from it.

Well-known examples of digital transformation include Über disturbing taxi business, Airbnb disturbing hotel business, and streaming of music and movies disturbing record company, cable television, or movie network business. Digitalization affects all businesses, and the impact will only increase in the future. Therefore, it is important that companies take a proactive approach, rather than waiting to see what will happen or thinking that their current position in the markets will remain the same if they do not do anything.

Digitalization is the key enabling issue for providing internal efficiency in organizations, or for providing external opportunities such as new services or offerings to customers. In addition, there can be disruptive changes in the operating environment of the company caused by digitalization. All of these changes can be translated into success even though digital transformation is a monumental and multi-dimensional concept. Each company's situation is different, as is clear from the case studies described. Thus, there is no silver bullet for tackling digitalization.

This paper explains a starting point for a systematic approach to tackle digital transformation that will help companies analyze the impact of digitalization and the needed steps for their specific environment. The method describes four main iterative steps: first company must define its position with respect to digitalization as well as goals that the company wants to achieve. Then the work needed to reach these goals must be defined based on identifying the gap between the goals and current state, which is followed by systematically planning a roadmap for success, and implementing the roadmap into practice utilizing proof of concepts as needed.

This paper describes the first version of the digital transformation model, derived from synthesis of diverse industrial cases carried out and existing literature. However, this model is currently quite generic, and further studies are needed to add detail and bring it closer to practice. In the future, we plan to further evaluate and develop the model in additional case studies and modify or bring details into the model as needed.

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