FACULTEIT ECONOMIE EN BEDRIJFSKUNDE

BUSINESS PROCESS MANAGEMENT IN SMES

CASE STUDY IN THREE BELGIAN SMES

Word count: 25.141

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Supervisor: Prof. dr. Frederik Gailly

Master's Dissertation submitted to obtain the degree of:

Master of Science in Business Engineering

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List of abbreviations

AI	Assessment Item
B2B	Business to Business
BPM	Business Process Management
BPR	Business Process Reengineering
BPM-CF	Business Process Management - Capability Framework
BPMM	Business Process Maturity Model
BPMM-FIS	Business Process Maturity Model - Fisher
BPMM-HR	Business Process Maturity Model - Harmon
BPMM-OMG	Business Process Maturity Model - Object Management Group
BPO	Business Process Orientation
BPO-MF	Business Process Orientation - Maturity Framework
BPO-MM	Business Process Orientation - Maturity Model
CEO	Chief Executive Officer
CIO	Chief Information Officer
CMM	Capability Maturity Model for software
CMMI	Capability Maturity Model Integration
COO	Chief Operations Officer
EA	Enterprise Architecture
e.g.	exempli gratia
EU	European Union
FIS	Fisher Maturity Model
HAM	Hammer maturity model
i.e.	id est
IT	Information Technology
MCC	McCormack maturity model
MM	Maturity Model
nr.	number
PEMM	Process and Enterprise Maturity Model
PJ	Process Jobs
PM	Process Measurement and Management Systems
PMF	Process Maturity Framework
PMMA	Process Management Maturity Assessment
PV	Process View
Q1	Quartile 1
Q3	Quartile 3
ROI	Return On Investment
RUM	Rummler-Brache Group Maturity Model
SEI	Software Engineering Institute
SME	Small and Medium-sized Enterprise
S&M	Sales and Marketing
US	United states
VBPM	Value-driven Business Process Management
vPMM	Value-based Process Maturity Model
vs.	versus

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1 Introduction

Companies realise more and more the importance of managing business processes to remain competitive in their continuously evolving sectors. In a world of intense global competition, declining response times, more demanding employees and more powerful customers than ever, organisations are confronted with everlasting difficulties to stay into business (McCormack, 2001). Because of the higher customer expectations, accompanied by the IT explosion of the past decades, enterprises are being taken out of their comfort zones and are facing new challenges which jeopardise their existence. Considering the above, organisations are increasingly focusing on the management of their business processes in order to excel in the domain of performance (Van Looy, De Backer, & Poels, 2014).

1.1 Problem definition

Business Process Management (BPM) is a relatively young and ever growing professional management discipline, which targets to improve corporate performance by managing business processes. Since BPM is often viewed from different perspectives (e.g. management strategy, software system, quality discipline, etc.), a universal, general definition does not exist (Chong, 2007; van der Aalst, ter Hofstede, & Weske, 2003). Van der Aalst *et al*. (2003) provide the following definition: "BPM subsumes a set of methods, techniques and software tools supporting the design, enactment, control and analysis of operational business processes in order to facilitate an optimised value creation." Rubens (2017) describes BPM as the practice of aligning goals and processes as businesses evolve. Another definition is provided by Jeston and Nelis (2006): "BPM is a management discipline concerned with lifting an organisation's performance through improvement, management and control of business processes."

Large and established organisations often invest substantial amounts of money and resources in this discipline and may even have an explicit BPM strategy. On the other hand, smaller and/or younger companies such as small and medium-sized enterprises (SMEs) do not always have the time, knowledge, financial resources and/or skilled personnel at their disposal to implement BPM adequately. Subsequently, responsibilities and competencies tend not to be clearly determined and business processes not optimally streamlined, which often results in inefficiencies and related costs in terms of performance.

Given the higher interest and involvement of large enterprises in this discipline, BPM research and practices are primarily focused on them, while the research on BPM in SMEs remains rather scarce.

This thesis serves the following purpose: *investigate how the management of business processes (Business Process Management) is done within SMEs in order to explore which elements need attention to obtain better business performance.*

1.2 SME definition

Small and medium-sized enterprises form the backbone of the European economy. They represent more than 99% of all the businesses, and provide ca. two-thirds of the total EU employment in the non-financial business sector (Muller *et al.*, 2016). SMEs play an important and versatile role in society. They create jobs, foster economic growth and ensure social integration. Furthermore, they stimulate entrepreneurial spirit and innovation, and they are responsible for the competitiveness in their respective industries (European Commission, 2016). The Belgian SMEs follow the European tendency; 99,8% of the enterprises in the non-financial sector are SMEs, while the Value Added and the Employment account for respectively 62% and 70% (Muller *et al.*, 2016).

The legal definition of a small and medium-sized enterprise varies by country, and sometimes by industry. What constitutes as an SME for the US differs from how China defines an SME, while Canada employs yet another definition. However, the European commission defines an SME based on two main factors:

1. staff headcount
2. either turnover or balance sheet total

The definition is defined in the EU recommendation 2003/361 (2003), and goes as follows: "The category of micro-, small- and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro, and/or an annual balance sheet total not exceeding 43 million euro." Within the SME landscape, three categories of enterprises can be distinguished: medium-sized, small, and micro enterprises (table 1).

Table 1: Specifications of SMEs (based on Muller et al., 2016)

Company category	**Staff headcount**	**Turnover**	or **Balance sheet total**
Medium-sized	< 250	≤ € 50m	≤ € 43m
Small	< 50	≤ € 10m	≤ € 10m
Micro	< 10	≤ € 2m	≤ € 2m

1.3 Research question

As BPM is a quickly evolving discipline, it may become difficult to assess the company's BPM support. This leads to the question of how advanced a certain organisation is in its development of BPM (Rosemann, de Bruin, & Hueffner, 2004). To assess the level of systematic process thinking in an organisation (Dumas *et al.*, 2013), Business Process Maturity Models (BPMMs) are developed. They can be described as 'measuring instruments' to gauge how advanced the BPM adoption of a particular organisation is, based on multiple BPM capabilities.

Over the last twenty years, a lot of BPMMs were developed. However, the level of empirical evidence that reveals the usefulness and validity of these models remains rather scarce (Tarhan, Turetken, & Reijers, 2016). What they almost all have in common, is that the process maturity concept is analogous to that of a process life cycle, which occurs in developmental stages, the so called 'maturity levels' (Lockamy III & McCormack, 2004). They assume that higher BPM maturity leads to higher operational performance (Skrinjar, Bosilj-Vuksic & Stemberger, 2008). Each maturity level lays a required foundation on which future improvements can be built, in order to reach business (process) excellence (Curtis & Alden, 2007; Van Looy *et al*., 2013). One can only move on to the next stage if all the BPM criteria of that particular stage are satisfied. However, the highest level of BPM maturity is not necessarily the best for any enterprise (de Bruin & Rosemann, 2005). The most appropriate BPM maturity level should be identified case-by-case, based on the enterprise's strategic intent, business context, related constraints, etc.

Once applied, these BPMMs can identify areas which require attention to advance the BPM support of the enterprise. These are the areas which run behind and should be focused on if an organisation would like to improve its BPM level. If the enterprise would be able to address those areas, they might be able to increase business performance.

The research question of this study can be described as follows:

What is the current state of Business Process Management (BPM) in Belgian SMEs, which elements are inhibiting its further implementation, and how can these be remedied to advance the BPM of the organisation?

1.4 Relevance

During an interview conducted by Marcello La Rosa (2016), Michael Rosemann, one of the most influential BPM researchers around the globe was asked the question whether there is a role for BPM in small and medium-sized enterprises. He answered this question firmly and substantiated. He admitted that BPM is a discipline that has been implemented mainly in large organisations. Nonetheless, his belief was that smaller organisations are developing an appetite for processes. Rosemann provided three reasons for this. First, there is the fact that SMEs have a small or even no buffer. **Cost efficiency** is an important driver for them. BPM can provide similar benefits in terms of cost efficiency for small companies as it does for large organisations. Second, there are the **growth ambitions** of most SMEs. If these companies want to conduct an informed growth strategy, they need to understand the mechanics of their processes and how they can scale up. Third, BPM offers the opportunity for SMEs to **understand their processes**, not only within the company, but also within their business environment (La Rosa, 2016). The understanding of the external processes a company takes part in was already a major concern of CMMI (Capability Maturity Model Integration) and later BPMM (cf. infra). This interview dates from 2016, so by the time of writing, the topic of BPM in SMEs is still an uncultivated area of research which nevertheless promises exciting opportunities.

The thesis is structured as follows. Section 2 presents the methodology and divides the research question into five smaller, more manageable steps. Section 3 covers prior research on the topics Business Process Management, Business Process Maturity Models and research about SMEs and BPM combined. In section 4, the actual case study is executed. Section 5 discusses the case study research and section 6 concludes this study and links the findings to the literature.

2 Methodology

To provide a substantiated answer on the research question, an accurate methodology is required. This section firstly covers the choice of an appropriate research method. Subsequently, the stepwise approach of the research consisting of five steps is explained. An accurate execution of these steps should enable the researchers to give a pertinent answer on the research question. To conclude, some remarks are made concerning the validity of the results.

2.1 Research method

To investigate the research question, a case study research is conducted in three Belgian SMEs. The justification of the case study research method is supported by a methodology developed by Yin (2014). Based on three conditions, appropriate research methods can be chosen out of five possibilities, namely experiments, surveys, archival analyses, historical analyses and case studies (Yin, 2014).

- Condition 1: **Form of research question**.
  The study is of an exploratory nature, as it is something which has not been studied extensively in the past. Given the elaborate nature of the research question, a combination of two research methods is used. To determine the current state of Business Process Management in Belgian SMEs, a survey is conducted. As the remaining part mainly focuses on how the results from these surveys can be used to improve the BPM of the SMEs, another research method is in order. It must be stated that the goal is not to provide conclusive evidence, but to create a better understanding. The preferred methods for this type of research are case studies, experiments or historical analyses.
- Condition 2: **Control of behavioural events.**
  The relevant behaviours of the examined SMEs cannot be manipulated by the researchers, which means performing an experiment is not a feasible option. This leaves two possibilities, namely a case study or a historical analysis.
- Condition 3: **Degree of focus on contemporary events.**
  As direct observation and interviews of the subjects involved in the study are important factors to the research, a historical analysis will not be sufficient to deliver satisfying results. This leaves a case study research as the best fit for this study.

2.2 Stepwise research approach

Taking the research question as a starting point, the researchers distinguished five steps to structure the case study process and promote the reliability of the study. After the enumeration of the steps, they are linked to a general case study methodology framework proposed by Yin (2014). This framework serves as a benchmark for the steps conducted in this study to make sure no aspects of the selected research method are left out.

2.2.1 **Step 1**: Selection of SMEs fitted for the case study

As this study highly depends on the input given by the participating companies, it is undesirable to randomly choose some SMEs with convenience as the main driver. In order to ensure a diverse set of companies that can provide relevant data, a selection procedure is developed and followed.

> *"Formulate a selection procedure for SMEs using well-considered criteria to single out SMEs that are fitted for the case study."*

2.2.2 **Step 2**: Selection of Business Process Maturity Models

As Business Process Management can be implemented in a wide variety of ways, the question arises how far organisations are in their BPM development (Rosemann *et al.*, 2004). Analogous to the implementation, the measurement of Business Process Maturity can be performed in numerous ways as well. For this case study research, the criteria of a large pool of maturity models were critically assessed to come up with a set of models that can serve as a starting point to assess the business process maturity level in each SME.

> *"Select Business Process Maturity Models by assessing their relevance, understandability and applicability to SMEs."*

2.2.3 **Step 3**: Fine-tuning of the Maturity Models

Since these models are mainly developed for large enterprises, they may contain elements not applicable to SMEs. Questions or expressions that are not relevant to smaller companies should be omitted and complex terminology must be worded differently to improve understandability.

> *"Fine-tune the maturity models to fit the structure and vocabulary of the considered organisations."*

2.2.4 **Step 4**: Application of the Maturity Models

When the maturity models have been fine-tuned to the specific characteristics of the organisation, one should determine its actual maturity level, i.e. the level of systematic process thinking in the organisation (Dumas *et al.*, 2013).

> *"Apply the fine-tuned or adjusted maturity models to the considered organisation and determine its maturity level or maturity stage."*

2.2.5 **Step 5**: Identification of action areas

Determining the maturity level does not deliver any value to a firm. It only displays how mature a certain company is in terms of their Business Process Management. The exercise of establishing the maturity level becomes interesting when the examination of the gathered data gives insights in action areas that need the most attention. In this way, recommendations can be made which may benefit the business significantly.

> *"Make recommendations of actions the organisations can take based on the outcome of the maturity models."*

Evaluating and combining these five steps should give a comprehensive answer to the main research question and make it possible to draw a concise conclusion.

Yin (2014) states that case study research is remarkably hard, even though case studies have traditionally been considered to be 'soft' research. The reason for this is that each case study is unique of its kind, and investigators do not always follow systematic procedures and rigorous methods to conduct the case study. To resolve this matter, Yin has developed a framework to conduct case study research, based on common case study research methodologies. This framework can be replicated by other researchers, and therefore ensure reliability and validity. However, adhering to this systematic procedure when conducting case study research is not always possible, nor desirable. Yin's framework does not reflect the most optimal way to conduct case study research, but serves more as a general guideline. Although the five steps distinguished by the researchers contain elements that deviate from Yin's framework, it can be shown that some of them adhere to it.

Yin's framework consists of an outline of the elements each case study needs to include, and is centred around five stages: Design, Preparation, Collection, Analysis and Report.

1. **Design** of the case study

   The case study design serves as the blueprint for conducting the case study research. In this section (section 2), the researchers presented the case study methodology; the so-called case study plan.

2. **Preparation** for data collection

   It stands to reason that the preparation of the case study research is essential for its successful execution. To prepare the case study, an extensive literature review was conducted (section 3), suitable SMEs were selected (section 4, step 1) and appropriate maturity models were chosen (section 4, step 2).

3. **Collection** of the data

   Case study evidence may come from many sources (Yin, 2014). For this case study, the researchers made use of two sources of evidence; in-depth interviews (guided conversations) and paper surveys (structured queries). The researchers maintained a clear distinction between the actual 'database' (the raw data), and its analysis/report, as proposed by Yin (2014). The data analyses are attached in Appendix (Exhibit 3 and 4).

4. **Analysis** of the case study evidence

   Yin (2014) mentions that the analysis of case study evidence is one of the least developed and most difficult aspect of doing case studies. Every case study should be centred around a general analytic strategy to reduce the potential difficulties inherent to case study research (Yin, 2014). This study follows the general 'relying on theoretical propositions' strategy. The researchers depart from the theoretical propositions found in the literature (the lack of BPM implementation and adoption in SMEs), and attempt to investigate whether this is the case in three Belgian SMEs. The analysis of the case study evidence is presented in section 4, step 4 and 5.

   This case study does not satisfy the minimal conditions in which computer-assisted tools (e.g. NVivo) can be extremely helpful (Yin, 2014, p. 135). As a result, the researchers will not make use of such tools to assist the analysis in order not to unnecessarily increase its complexity and extent.

5. **Report** of the case study

   The researchers kept in mind the procedures in conducting a case study report (Yin, 2014) while writing the case study report (e.g. defining the audience for the report, defining its compositional format in advance, having drafts reviewed by others, etc.).

2.3 Validity

As there is only data collected from three separate companies, it is not possible to conduct a statistical analysis, nor to generalise the results. Conclusions should be drawn from the results at hand for each case study separately and compared to each other. To approach the research question as scientifically substantiated as possible, four main criteria for judging the quality of research designs are kept in mind (Yin, 2014).

- Construct validity: This criterion entails the degree to which inferences can be drawn accurately from the operational measures identified to concretise the theoretical constructs (Trochim, 2006). Yin (2014) proposed some tactics for dealing with this. Using multiples sources of evidence, such as documentation, interviews and participant observation can strengthen the case study research. He also suggested to establish a chain of evidence, which should allow an external observer to follow how the researchers derived any evidence.
- Internal validity: In order to establish internal validity, the research goal should be to examine a causal relationship (Trochim, 2006). This is mainly a concern for explanatory case studies. As the purpose of this thesis is only exploratory, this type of validity will be neglected.
- External validity: This construct deals with the issue of generalisation. The main question here is whether a study's findings are generalisable beyond the immediate study (Yin, 2014). Although this research is unable to provide a statistical analysis, the results are analysed extensively to expose certain BPM elements which are found across the three SMEs. On the one hand, BPM elements are identified that are developed the most, but also elements that are lacking the most (i.e. elements which are inhibiting the further implementation of BPM) over the three SMEs. These elements might be generalisable, provided that more case studies are conducted which makes a valid statistical analysis feasible (which is beyond the scope of this study). On the other hand, the researchers try to identify elements inherent to the BPM maturity models, which are deemed to be irrelevant to assess in SMEs. Since the maturity models are mainly developed for large enterprises, the researchers expect that some elements are irrelevant to examine within an SME context.
- Reliability: The objective of the final criterion is to make sure that when the study is replicated by other researchers using the same procedures, they should reach the same findings and conclusions (Yin, 2014). The purpose is to diminish possible errors or biases. Yin (2014) stresses the importance of documentation for this matter and suggests the use of a systematic research procedure and a case study database.

3 Background

To conduct the study, one must have a clear and obvious overview of the current state of affairs in literature. First, this section discusses the literature about Business Process Management and related topics. The second paragraph elaborates on the evolution and definition of Business Process Maturity Models. To continue, the leading Business Process Maturity Models in literature are briefly presented. Finally, this section provides an overview of the existing research of the two concepts combined: Business Process Management and small and medium-sized enterprises.

3.1 Business Process Management

As mentioned in the introduction, BPM is still an emerging and ever growing professional discipline. It is a systematic approach, focusing on improving business (process) performance by visualising, streamlining, managing and optimising the business processes of an enterprise. Looking at the evolution of the discipline proves that it is still in its infancy.

Lusk, Paley and Spanyi (2005) divided the evolution of BPM in three waves. The first wave is called **Process Improvement** (70s-80s). This wave is characterised by a focus on quality improvement (Total Quality Management) and reduction of defects (Six Sigma). A second wave came in the 90s, called **Business Process Reengineering (BPR)**. Process innovation is key here; making processes better, faster and cheaper was the largest concern. Later, starting in the 21st century, this evolved in the third wave, namely **Business Process Management**. Processes are not seen individually anymore, but as part of a larger system. They should be viewed as strategic assets (McCormack & Johnson, 2001). As a result, enterprises should adopt a Business Process Orientation (BPO). Through years of interdisciplinary research and several BPM initiatives in all kinds of corporations, BPM has become a holistic management discipline (Rosemann & vom Brocke, 2015). It covers the entire process lifecycle, and it consolidates important strengths and advantages of its predecessors including Business Process Reengineering, Total Quality Management, Lean Management, Six Sigma, Constraint-based Theory, Kaizen, Process Innovation, etc. (Chong, 2007). It is a continuous journey, not a one-time event. Business processes are dynamic, with goals and processes changing along the way (Rubens, 2017). It stands to reason that managing them cannot be a static procedure. This would undoubtedly lead to an unfortunate situation where opportunities are left unexploited.

3.1.1 BPM decomposition

Since Business Process Management is a very encompassing management discipline, it is hard to explain the concept in terms of a single definition (cf. supra). Most BPM definitions remain at the surface and can be vague, non-exhaustive and difficult to grasp. Therefore, Rosemann and vom Brocke (2015) have decomposed BPM into six essential 'core' elements. All these elements represent a critical success factor for BPM implementation, and they all must be addressed properly for its successful and sustainable deployment. The six factors provide a holistic understanding of Business Process Management (de Bruin, 2009).

1. **Strategic Alignment: "**A tight linkage between the overall strategy and goals of the organisation, and the enterprise processes." (Rosemann & vom Brocke, 2015)
2. **Governance:** "Appropriate and transparent accountability in terms of roles and responsibilities for different levels of BPM." (Spanyi, 2014)
3. **Methods:** "The set of tools and techniques that support and enable activities on all levels of BPM." (Rosemann & vom Brocke, 2015)
4. **Information Technology:** "The software, hardware and information systems which support and enable business process activities." (Rosemann & vom Brocke, 2015)
5. **People:** "The individuals of an organisation who continuously enhance and apply their process and process management skills and knowledge to improve business performance (the human capital of an enterprise)." (Rosemann & vom Brocke, 2015)
6. **Culture:** "The collective values and beliefs of a group of people" (Schein, 2004) "that shape process-related attitudes and behaviour to improve business performance." (de Bruin, 2009)

These six main factors are again subdivided in five sub-areas, the so called 'capability areas'. Along with the main factors, they provide a holistic framework of the concept Business Process Management: the Business Process Management Capability Framework (BPM-CF) (Rosemann & vom Brocke, 2015). The framework is displayed in table 2.

Table 2: The BPM-CF (Rosemann & vom Brocke, 2015)

Strategic Alignment	Governance	Methods	Information Technology	People	Culture	Factors
Process Improvement Planning	Process Management Decision Making	Process Design & Modelling	Process Design & Modelling	Process Skills & Expertise	Responsiveness to Process Change	Capability Areas
Strategy & Process Capability Linkage	Process Roles and Responsibilities	Process Implementation & Execution	Process Implementation & Execution	Process Management Knowledge	Process Values & Beliefs	
Enterprise Process Architecture	Process Metrics & Performance Linkage	Process Monitoring & Control	Process Monitoring & Control	Process Education	Process Attitudes & Behaviors	
Process Measures	Process Related Standards	Process Improvement & Innovation	Process Improvement & Innovation	Process Collaboration	Leadership Attention to Process	
Process Customers & Stakeholders	Process Management Compliance	Process Program & Project Management	Process Program & Project Management	Process Management Leaders	Process Management Social Networks	

It is assumed that a higher level of maturity in each of these core elements results in a higher level of process performance, and consequently in a higher level of business success (de Bruin & Rosemann, 2005) (figure 1). However, the link between BPM and measurable corporate value is one of the largest challenges BPM is faced with, as explained in the following paragraph.

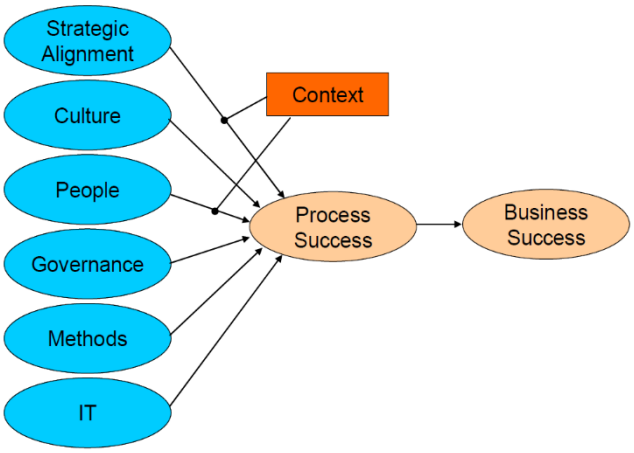


Figure 1: Relationship BPM core elements and Business Success (de Bruin & Rosemann, 2005)

3.1.2 BPM contribution to corporate value

As mentioned before, Rosemann & vom Brocke (2015) state that BPM has evolved to a holistic management discipline. However, unlike other management disciplines, the conceptualisation and management of business processes is still facing some fundamental challenges (Franz, Kirchmer, & Rosemann, 2012). One of the hardest challenges is the link between BPM and its contribution to corporate value. According to McCormack and Johnson (2001), value and processes should be 'seamless' in the eyes of the customers. Burlton (2011) states that measurable results (and deliverables) are required to demonstrate BPM success. Nevertheless, a clear return on investment (ROI) from BPM initiatives is often missing, and this seriously affects the credibility of BPM.

3.2 Business Process Maturity Evolution

Business Process Maturity Models are used to assess how advanced the BPM development of an organisation is. The concept of maturity goes back to 1980. A short overview:

Philip Crosby (1980) made the first notion of the concept 'maturity'. He defined it as 'the state of being complete, perfect, or ready' (Tarhan *et al.*, 2016). Following this notion, he developed the **Quality Management Maturity Grid** (Gaskell, 2012). While this model is situated in the domain of quality management, the framework was an inspiration for many BPMMs.

The first real modern use of maturity models was in the late 1980s, namely when Watts Humphrey created the **Process Maturity Framework (PMF)** at the Software Engineering Institute (SEI) (Curtis & Alden, 2007). It provided the opportunity to determine the capabilities of software-developing companies. Using this framework, such companies could be easily assessed and priority areas for improvement could be identified (Humphrey, 1988). Analogous to the Quality Management Maturity Grid, the Process Maturity Framework is composed of five maturity stages, each with their respective requirements.

Throughout the 1990s, Humphrey's framework has been elaborated by the SEI into the **Capability Maturity Model for Software (CMM)** (Curtis & Alden, 2007). The initial model was not the final version though; by means of workshops with software professionals and feedback from the community, adaptations were made. The CMM helps developers in selecting process-improvement strategies based on the issues most pressing to improve the software quality. These issues are determined by the current process maturity (Paulk *et al.*, 1993).

Following this, the CMM grew into the **Capability Maturity Model Integration (CMMI)** (Curtis & Alden, 2007). The largest criticism of the previous models was the fact that they were focused on specific activities in specific organisations. They did not offer a systemic approach to general issues that many companies are facing. To solve this, CMMI offers general models and guidelines that go beyond disciplines. It does not only focus on software engineering (as CMM does), but it also integrates systems engineering, integrated product & process development and supplier sourcing (Constantinescu & Iacob, 2007).

Tarhan *et al.* (2016) claim that CMMI - and by extension all previously discussed models - inspired the development of maturity models in certain different domains, including BPM. The **Business Process Maturity Model (BPMM)** was principally designed for this emerging area of study. It is based on the principles of Humphrey's PMF and the development was led by co-creators of the CMM for software and CMMI (Curtis & Alden, 2007). For this reason, many BPM models show notable similarities with its predecessors. Curtis & Alden (2007) also state a striking difference between BPMM and CMMI. While CMMI has a more project bounded orientation, BPMM tends to guide improvement of business processes more as workflows across organisational boundaries. At the moment of writing (2017), many maturity models have been developed.

3.3 Business Process Maturity Models

BPMMs exist in all sorts of shapes and sizes and have been designed by people with different backgrounds, going from academic BPM experts to professional consultants. Van Looy *et al.* (2013) state that the huge number of BPMMs raises questions about their substantial differences. This just goes to show that Business Process Management is not an objective discipline. As with management in general, there is room for interpretation and personal preferences. Nevertheless, it is not guaranteed that a certain model will work equally well for two different companies. The maturity model best suited to a business depends on the criteria prioritised by this company.

Tarhan *et al.* (2016) conducted an elaborate systematic literature review on BPMMs. They selected 61 out of the 2899 studies initially retrieved, all published between 1990 and 2014. Combining these studies provided fundamental insights in the characteristics and current use of maturity models in BPM practices. They evaluated the level of **empirical research** of the 'leading' BPMMs - with respect to the attention they acquired in the academic research - and other 'non-leading' BPMMs. This was done by using a classification scheme they developed, centred around research content and research focus.

The 'leading' models reported in literature consist of the following (Tarhan *et al.*, 2016);

BPM - CF (Rosemann & de Bruin, 2005)
PEMM (Hammer, 2007)
BPO - MM (McCormack & Johnson, 2001)
BPMM - FIS (Fisher, 2004)
BPMM - OMG (Object Management Group, 2008)
BPO - MF (Willaert *et al*., 2007)
PMMA (Rohloff, 2009)
vPMM (Lee, Lee & Kang, 2009)
BPMM-HR (Harmon, 2004)

A remarkable conclusion from the research of Tarhan *et al.* (2016) is that the focus in the BPM community lies on model development in favour of their empirical evaluation. Academic literature lacks methodical applications of even the mainstream BPMMs. In general, there is very limited evidence on the validity and usefulness of the (leading) maturity models (Tarhan *et al.*, 2016). Only the leading models BPM-CF (Rosemann & de Bruin, 2005) and BPO-MM (McCormack & Johnson, 2001) have studies reporting both on their empirical application and validation as their main focus of interest. Although a lot of BPMMs are developed, their use in practice is limited. Tarhan *et al.* (2016) state that this is one of the main causes which hinders the widespread usage of the maturity models in the BPM community.

Van Looy *et al.* (2013) support the findings of Tarhan *et al*. (2016) that BPMM literature is mainly restricted to the development of BPMMs. In addition, they emphasise the lack of a clear BPMM overview and any selection support to select a maturity model that will best suit the needs and characteristics of an enterprise. An extensive pool of maturity models is available, but the challenge is to select an appropriate model which can assess the BPM adoption level of a company in a proper manner. Therefore, they have developed the **BPMM Smart-Selector** (Van Looy *et al.*, 2013), an online tool to select the most appropriate maturity model(s), depending on the individual needs and characteristics of an enterprise. Hence, the tool enables an informed maturity model choice, rather than an ad hoc selection which occurs too frequently and is undesirable.

The tool consists of a questionnaire with decision criteria which enable an appropriate BPMM selection. The decision criteria are linked to a dataset of 69 different maturity models developed between 1991 and 2010, found via academic databases and non-academic search engines. Fourteen criteria must be considered, which are derived from an international Delphi study. After the assessment, the tool recommends a list of BPMMs that best fit the needs and characteristics of an enterprise, after which they can start to use the model(s) to improve business processes and enhance (business) performance.

3.4 Business Process Management and SMEs

Over the last two decades, Business Process Management gained more and more attention and it became almost a necessity for businesses to manage their business processes to remain competitive. Therefore, a lot of research has been done on this relatively new management discipline and a lot of businesses started to implement BPM. However, compared to large enterprises, BPM practices in SMEs are rather low regardless of its potential impact (Bandara & Opsahl, 2017). Questions are raised whether BPM is generally applicable to SMEs (Reher, 2015). This may explain why the research of BPM in SMEs is rather scarce. Braunnagel *et al.* (2016) state that a broader evaluation of BPM adoption in SMEs is missing.

The focus of BPM as a comprehensive management discipline has principally been linked to larger enterprises (Dallas & Wynn, 2014). Large enterprises have a higher interest in BPM, and frequently invest substantial amounts of money and resources in this discipline. As a result, BPM research tends to be linked to parameters in large enterprises, and it may not be suited or agile enough to comply with the specific constraints of SMEs. These smaller companies may perceive the discipline as being non-flexible and/or effective enough to be so-called SME-friendly. Additionally, they may be reluctant to believe this discipline can provide benefits which may result in actual corporate value (Riley & Brown, 2001;

Smith & Fingar, 2003). Hence, it is understandable that SMEs are not always fully convinced that BPM could achieve measurable benefits for them, which causes them to turn down a possible implementation.

The fact that SMEs may be somewhat reluctant towards the ROI of BPM does not necessarily mean that they have no interest in the discipline. On the contrary; the changing economic environment has led to an increasing interest among SMEs in improving organisational business processes to enhance performance (McCormack et al., 2009; Ranganathan & Dhaliwal, 2001). Apart from large enterprises, SMEs have also developed an appetite to streamline, optimise and manage their processes in their value seeking endeavour (La Rosa, 2016). The discipline is however constantly evolving. This may be a reason why most SMEs have not initiated BPM initiatives yet. Keeping up with this evolution takes up time and money, which are both delicate topics in SMEs.

As mentioned before, the research related to BPM adoption by SMEs is rather scarce. Scientific and valid empirical studies are limited and may be outdated, and are mainly focused on large enterprises or on BPM's predecessor BPR. The empirical studies that are available are mostly case-specific, related to a certain industry and/or country. This limits the generalisation of its results (Lu, Huang, & Heng, 2006). For example; Chong (2007) examined BPM implementation by ten SMEs in the Australian wine industry. Imanipour, Talebi and Rezazadeh (2012) studied BPM adoption in 28 SMEs in the Iranian e-retail sector. Okręglicka, Mynarzová and Kaňa (2015) verified Business Process Maturity in 138 Polish SMEs. Braunnagel, Falk, Wehner and Leist (2016) examined the BPM adoption in ten Bavarian SMEs, Dallas and Wynn (2014) studied BPM initiatives within an Australian Small Business, etc.

3.4.1 BPM challenges for SMEs

Based on the empirical case studies, accompanied by findings of Kirchmer (2017), Lückmann and Feldmann (2017) and an elaborate literature review executed by Chong (2007), several elements inhibiting the successful implementation of BPM at SMEs could be identified. When reflecting on these obstacles in BPM adoption, one should always consider the major limitation of the current research; the generalisation of its findings and the extent to which these can be extended to other areas and industries (Imanipour, Talebi and Rezazadeh 2012). The most cited inhibiting elements in current research are the following (not ranked in order of importance).

1. Lack of financial resources

The pockets of small and medium-sized enterprises are not as deep as their larger colleagues. Large enterprises dispose of significant financial buffers in case things go wrong, and have less problems raising additional financial resources through debt or equity financing (Kirchmer, 2017). Often, the owner of the SME has invested his own money into the company, and does not want to dilute his

majority position by attracting external capital. Consequently, less financial resources are available to invest in branches like BPM which do not always deliver measurable benefits in the eyes of SMEs (cf. supra). After all, initiating a BPM project without sufficient financial resources and cash-flow provisions would threaten company solvency (Chong, 2007). Even if SMEs would see and understand the potential benefits BPM could offer, they do not always invest in it because they simply cannot afford it.

2. Lack of human resources and multiple roles of employees

As mentioned above, small businesses often operate under considerable cost pressure. Other inseparable key inhibiting elements are the constrained human resources and the limited access to skills (Fogarty & Armstrong, 2009). It stands to reason that SMEs employ a limited number of employees. Consequently, all employees must focus on their crucial, day-to-day operations (Kirchmer, 2017). As a result, human resources are not always available to initiate BPM practices, which should be started as projects. Once initiated, SMEs may lack human resources to follow up and manage the initiatives in a consistent manner. Often, employees in SMEs play multiple roles. Their day-to-day tasks can vary a lot and there is little time for additional tasks. If BPM would be implemented, it should be integrated with the multiple tasks of SME employees. It must be clear that additional effort in one area truly leads to less work in others, or that the resulting benefits justify the investment and lead to a proper ROI. However, the employees often work on islands, only considering their own (multiple) roles, without consulting each other in an appropriate way (Kirchmer, 2017).

3. Lack of time

As a result of the two previous challenges, it is hard for smaller organisations to staff projects over a long time period, resulting in a great time pressure for any initiative (Kirchmer, 2017). If a BPM project is initiated, the person responsible (e.g. project manager) is usually only available part-time.

4. Lack of (information technology) expertise

SMEs often lack sufficient technological skills and tool know-how necessary to develop a BPM infrastructure (Dallas & Wynn, 2014). Information Technology is often underdeveloped and personnel is not skilled enough to implement, update and manage IT properly. SMEs may lack resources to employ specialist CIOs and knowledge management supporting officers (Daniel & Grimshaw, 2002), nor to hire BPM technology specialists and information management consultants (Chong, 2007). Often, IT is considered as an overhead cost that must be kept to a minimum (Kirchmer, 2017). Some SMEs are also forced to utilise ‘off-the-shelf software products’, which do not consider all relevant specific characteristics of the particular SME (Chong, 2007).

Apart from their technological skills, SME employees often lack other BPM related skills. Chong (2007) and Imanipour *et al.* (2012) refer to the lack of BPM education of employees in SMEs in general.

Resistance to change due to fear of new technologies, lack of well-defined responsibilities and accountability, and lack of teamwork spirit are examples of skills which are underdeveloped within SMEs (Chong, 2007; Imanipour *et al.*, 2012).

5. Lack of support from senior management

Support from senior executives or the leadership of the company is a crucial determining element for BPM success (Raymond, Bergeron & Rivard, 1998; Lückmann & Feldmann, 2017). BPM initiatives must be supported by senior management to increase its credibility towards the employees and to ensure its continuation and adaptation (Chong, 2007).

6. Lack of process-oriented approaches

SMEs are often characterised by an underexposure of process orientation and project management capabilities (Lückmann & Feldmann, 2017). According to Imanipour *et al* (2012), supporting tools and methods for process visualisation and documentation are lacking. They also state that the level of business (process) metrics and/or measurement protocols for assessing process management performance is low within SMEs. To conclude, Chong (2007) mentions that a sound knowledge of process-oriented optimisation frameworks is essential to the success of BPM.

These six elements are assumed to be the most mentioned general problems for SMEs, when adopting or implementing BPM initiatives. It stands to reason that this is not an exhaustive enumeration. For an extensive overview of possible elements inhibiting the implementation of BPM in SMEs, the researchers refer to Imanipour *et al.* (2012).

Finally, a remarkable finding which contradicts prior research is provided by the study of Van Looy and Van den Bergh (2017). They statistically analysed the effect of organisation size (and sector) on the adoption of BPM, using data from 2309 employees in 72 West-European organisations. Surprisingly, the study concluded that no dependency could be found between BPM adoption and the size of the enterprise. Hence, the results suggest that BPM adoption levels can be equally achieved by SMEs and their larger counterparts, contradicting traditional assumptions. It must be emphasised that the finding of this study is uncommon in the literature about BPM in SMEs. However, due to its recency and the extent of the dataset, it cannot be overlooked. The study shows that SMEs progressed compared to older studies in the adoption of BPM (Van Looy & Van den Bergh, 2017).

4 Case study research

The framework of the study has been set forth in section 2. With an extensive literature review on BPM, BPMM and BPM in SMEs as the roots of the research, the actual case study can commence.

This section is organised parallel to the methodology. It starts by discussing the selection procedure of appropriate SMEs. Next, BPMMs which are suited to assess the BPM support of the SMEs are selected. As this step does not require input from the SMEs, it can be executed before an interview is conducted. Subsequently, the selected models are fine-tuned in consultation with someone occupying a managerial position within the company. Next, the outcomes of the BPMMs are discussed. Finally, having gathered all relevant data, the researchers identify action areas and propose improvement initiatives.

4.1 **Step 1**: Selection of the SMEs fitted for the case study

A predetermined procedure was used to select SMEs most suited for the practical evaluation. This procedure is based on criteria which were formulated beforehand. Since the research is of an exploratory nature, the cooperating SMEs had to be convinced that this study could have value for them in order to collaborate. For instance, there were no financial resources to reimburse the SMEs for their cooperation.

The remainder of this step firstly discusses the selection procedure, based on specific criteria. Next, the selected SMEs are briefly introduced.

4.1.1 Selection procedure

This is not an in-breadth study in which a large number of SMEs are consulted in order to extrapolate the outcomes and generalise the results. The researchers do not have the time, nor the resources to conduct a study of this extent. The scope of the study is rather an in-depth one, where a limited number of SMEs are consulted and organisation-specific action areas are identified based on the organisation's maturity level. The researchers believe this can provide valuable insights into how BPM can be used to benefit SMEs.

Several criteria the SMEs selected for the study had to comply with, were formulated beforehand. They are ranked below according to decreasing importance.

The SME:

1. complies with the EU recommendation 2003/361 definition of SMEs,
2. has growth ambitions,
3. is willing to cooperate actively.

The first requirement is self-evident. Given that this thesis focuses on SMEs, the respective companies considered in this case study need to fit the definition of such companies.

The second one is emphasised, since the researchers can deduct from an interview with M. Rosemann (La Rosa, 2016) that in the emerging field of BPM, one should have clear growth ambitions in order to implement BPM decently and fully make advantage of its use. For example, the local Bed & Breakfast, which employs three people, which has had no structural changes to pursue growth and has provided the same service during the last 15 years is not perceived well-suited. For reasons of convenience, only small and medium-sized (and not micro) enterprises are considered. This is supported by Okręglicka, Mynarzová and Kaňa (2015), who state that business processes are often poor and unstructured in micro enterprises.

The third criterion demands SMEs that are willing to contribute actively to the study. This means that the enterprises are willing to sit down together (physically) with the researchers during the three contact points, and are open to communicate by phone or email on different occasions. It would be a waste of energy, time and resources for both sides if one of the parties would decide to cease the cooperation after the first contact point. Before the actual study could begin, it had to be known with absolute certainty that the selected SMEs totally supported the study and saw value in its contribution.

The three SMEs that were eventually selected out of a set of 24 enterprises are the following: Fero, Vossaert Kitchens-Interior and Maes Compressors (table 3). An extensive overview of the stepwise selection procedure is included in Appendix (Exhibit 1).

Table 3: Selected SMEs for the case study

	Company	Sector	Employment (FTE)	Turnover/ *Gross margin*	Balance sheet total
1	Divico	Information Technology	missing	missing	missing
2	Tradelio	Food	missing	missing	missing
	Micro				
3	LogisolPro	Logistics	missing	€ *132 316*	€ 1 064 619
4	Kodibox	Removal firm	4	€ *-199 778*	€ 165 116
5	Aircompact	Industrial equipment	10	€ *783 619*	€ 1 717 862
	Small				
6	ANG	Containers and metal products	4	€ *298 011*	€ 2 469 958
7	Twikit	Information Technology	11	€ *-150 115*	€ 787 553
8	Cube	Food	12	€ *844 691*	€ 1 973 594
9	Nestor	Human Resources	14	€ *344 799*	€ 314 564
10	Bucomat	Cattle feed and agricultural products	14	€ *1 054 416*	€ 2 389 412
11	Ekopak	Wastewater treatment	16	€ *1 430 290*	€ 3 456 344
12	Extremis	Interior	25	€ *1 857 380*	€ 4 275 094
13	Maes Compressors	Industrial equipment	37	€ 7 790 472	€ 4 516 971
	Medium-sized				
14	Marfashion	Textile	40	€ *1 530 678*	€ 1 759 375
15	Procotex	Textile	28	€ 36 969 646	€ 25 836 182
16	GMP	Plastic materials	30	€ 10 707 540	€ 5 766 184
18	Fero	Heating and construction	51	€ 24 601 249	€ 14 140 462
17	Vossaert Kitchens-Interior	Interior	54	€ *3 115 148*	€ 5 251 442
19	Momentsfurniture	Interior	62	€ 14 728 287	€ 8 417 327
20	Dekeyzer-Ossaer	Food	64	€ 20 378 037	€ 11 624 414
21	Vande Moortel	Stone bakery	95	€ 25 135 457	€ 15 428 710
22	Concordia Textiles	Textile	242	€ 41 566 120	€ 24 566 459
	Large				
23	Vandemoortele	Food	68	€ 461 815 135	€ 678 780 225
24	Muldernatural Foods	Food	170	€ 119 374 271	€ 53 713 946

4.1.2 Introduction of the selected SMEs

4.1.2.1 Case study 1: Fero

Fero is a Belgian importer and distributor of stoves, fireplaces, inox tubes and accessories on wood, pellets, gas, bioethanol and electricity. As a wholesaler, it purchases its products from suppliers around Europe and distributes them to retail dealers in the Benelux. Hence, Fero does not interact directly with

private individuals and serves the B2B market. The company was founded in 1988 by two colleagues who already gained experience in the stove industry and wanted to start on their own. During the 90s and early 2000s, the firm grew organically. Anno 2018, the firm consists of 51 employees, has an annual turnover of ca. € 25.000.000 and a balance sheet total of ca. € 14.000.000.

Initially, the core business consisted of inox tubes and accessories, but over the years, the focus shifted more in the direction of stoves and fireplaces. To cope with their different products, the firm has divided its operations over different sub departments which are all present under one roof. Because of an intense and loyal collaboration of nearly 30 years with their suppliers and dealers, Fero is an established and renowned name in its sector. According to 'Trends Top', Fero is the third largest player in its sector in Belgium. Apart from their products, Fero offers services as well. Fero employs a team of technicians who are not only able to repair stoves, tubes or accessories for their B2B dealers, but also educate technicians from their dealers on how to tackle stove related defects. Moreover, the sales team of Fero schools the representatives of the different dealers as well on several training moments throughout the year.

4.1.2.2 Case study 2: Vossaert Kitchens-Interior

Kitchens-Interior Vossaert is a family-owned enterprise located in Oudenaarde, founded in 1925. Anno 2018, the fourth generation of the family Vossaert runs the business. Vossaert produces customised 'fixed' furniture (i.e. furniture which cannot move): kitchens, bathrooms, offices, closets, cupboards, etc. They can equip a whole house from scratch with customised fixed furniture. Their customer base consists mainly of private individuals, but they also serve the B2B market: business offices, medical cabinets, project developers, etc.

To produce such a complex product as customised furniture, they focus on the vertical integration of their production process. They have complete control over the production of their products, from raw materials to final assembly. In their two production plants, everything is made end-to-end and nothing is outsourced. The production machinery in the two plants is the same, so Vossaert is flexible when one of the machines is down and the laborers can operate the machines in the two plants. Vossaert has two showrooms, one in Oudenaarde and one in Knokke at the Belgian coast.

Currently, Vossaert employs 54 people. The annual gross margin is € 3.115.148 and the balance sheet total amounts to ca. € 5.300.000. Vossaert is firmly anchored in and around Oudenaarde. Over the years, it has built up an excellent reputation, with a strong emphasis on quality and service. With seven installation teams and an after sales team, they can offer their customers relatively short and flexible delivery times.

4.1.2.3 Case study 3: Maes Compressors

Maes Compressors is a distributor of industrial compressors, generators and accessories located in Deinze. They consider their product, compressed air, as 'the oxygen of a production process' and therefore indispensable in a production environment. The enterprise covers the B2B market, and focuses on large production enterprises like Coca Cola or Clarebout Potatoes to name a few. Customers can purchase their products, but can also rent them for a certain period. A strong focus lies on the maintenance of the compressor, provided by a large team of technicians with a lot of industry experience.

The company was founded in 1978 by Valère Maes, a technician with experience in the sector who wanted to start on his own. Next, the firm grew organically under the management of Mr. Maes and his wife. Over the last two decades, the ownership of the firm has changed a couple of times. Currently, the Atlas Copco Group owns the business; a global industrial group of companies which manufactures industrial tools and equipment, headquartered in Sweden. Anno 2018, Maes Compressors consists of 37 employees. The annual turnover amounts to ca. € 8.000.000, with a balance sheet total of ca. € 4.500.000.

4.2 **Step 2**: Selection of Business Process Maturity Models

To assess the BPM adoption of the three considered SMEs, appropriate and well-suited BPMMs are required. By using a maturity model, an organisation can assess and evaluate how mature it is based on multiple BPM capabilities, and which ones of those capabilities require attention.

In the following, the selection procedure to select the most optimal BPMMs for the practical evaluation of this case study research is discussed. It is unlikely that there is one model suited for all SMEs. For this reason, several models which are rather complementary will be selected to be able to perform an exhaustive examination.

The BPMM Smart-Selector developed by Van Looy *et al.* (2013) and the extensive BPMM literature review by Tarhan *et al.* (2016) are used as a starting point for the selection procedure.

4.2.1 Selection procedure

Based on the BPMM Smart-Selector developed by Van Looy *et al.* (2013), a set of suitable maturity models is retrieved out of a dataset of 69 maturity models (cf. supra). Initially, the selection procedure was intended to be on a case-by-case base. However, when considering the fourteen criteria (questions) which form the base of the Smart-Selector, the researchers noticed that the answers to the questions were similar for each SME, if not the same. As a result, the selection procedure can be executed for the three SMEs combined.

When initiating the Smart-Selector procedure, the researchers went through the fourteen criteria and split them up in three categories: strategic hard constraints, pragmatic hard constraints and soft constraints.

Strategic hard constraints

These constraints imply the criteria which must be satisfied at all times due to the nature and intended direction of the case study research. Criteria in the Smart-Selector must be set equal to a certain answer to use maturity models which are in line with the research question.

- Type of business processes: Generic
  The case study research is supposed to be executed for business processes in general, instead of business processes adapted to particular business domains.
- Nr. of business processes: All
  The researchers want to assess the BPM development of an SME on a general and conceptual level, instead of assessing the maturity of a single business process or subprocess.

- Architecture details: Prescriptive (implicit or explicit)

  Rather than descriptive models, the researchers want to include prescriptive BPMMs, where a 'road map' explains which BPM criteria per maturity level must be satisfied before the next level can be attained.

Pragmatic hard constraints

These constraints imply criteria which must always be satisfied, due to pragmatic and feasibility reasons. The researchers have limited time and resources at their disposal. As a result, they need to outline, define and adjust their scope unambiguously before maturity models can be selected.

- Direct costs: Free

  The researchers do not have financial resources to purchase maturity models. Therefore, the selection scope is limited to free models.
- Assessment availability: Fully known

  This constraint results from the previous constraint. The maturity model should be publicly available.
- Assessment duration: Day

  The researchers should carefully deal with the limited time of the considered SMEs. Therefore, any maturity model with an assessment duration longer than a day is omitted.
- Functional role of respondents: Internal

  Consulting external respondents like customers, suppliers, partners, etc. would require too much additional time and resources. Therefore, the assessment is limited to the input of internal respondents.
- Rating scale: Qualitative data

  The data needed to execute the business process maturity exercise will most likely consist of open questions or questions with nominal or ordinal rating scales, rather than discrete, interval or ratio rating scales (quantitative data).

Taking the hard constraints into account, the Smart-Selector recommends eight maturity models: HAM (Hammer, 2007), MCC (McCormack & Johnson, 2001), FIS (Fisher, 2004), BIS (den Boer & Noordam, 2010), O&I (O&I, 2010), RUM (Rummler-Brache Group, 2004), SCH1 (Scheer, 2007), and SKR (Skrinjar *et al.*, 2008). When comparing these models to the 'leading' BPMM models defined by Tarhan *et al.* (2016) (cf. supra), three models occur in both lists: HAM, MCC and FIS (which are respectively called PEMM, BPO-MM and BPMM-FIS in the jargon of Tarhan *et al.* (2016)).

The challenge is to narrow this list of eight down to a set of ca. three models, which can execute the assessment in the most optimal way. Based on the remaining criteria of the Smart-Selector which were not addressed yet, the researchers defined additional soft constraints.

Soft constraints

Unlike the hard constraints, these constraints may be violated. Criteria are preferably equal to a certain answer, but violations that deviate from this answer are allowed, although undesirable.

- Validation: Yes

  Tarhan *et al.* (2016) lack the level of empirical evaluation of maturity models. Hence, models which have proven their usefulness and validity are preferred over theoretical models which are not (yet) empirically validated.

- Nr. of assessment items: Trade-off

  More assessment items (AIs) provide more insights to assess the maturity level, but take longer. Therefore, a combination of maturity models with varying amounts of AIs may be the most opportune compromise.

- Capabilities: Basic + Culture + Structure

  This criterion stipulates the scope of the maturity model; which capabilities an organisation wishes to assess and subsequently improve by using a maturity model. Van Looy *et al.* (2014) determined six capabilities. Modelling, deployment, optimisation and management represent four of them. They are bundled as *Basic* capabilities, since they belong to the traditional process lifecycle. *Culture* and *Structure* are the other two capabilities, and they are considered to be organisational characteristics. The researchers want to assess the maturity level of the SMEs as broad as possible. Therefore, all six capabilities are preferably included in the BPM Maturity assessment.

- Collection technique: Subjective

  To conduct the case study research, data collection techniques will probably be limited to questionnaires, interviews and observations with internal stakeholders, rather than objective document reviews of existing, written material (e.g. policies, standards, process models and performance reports, etc.). Ideally, the data collection technique consists of subjective and objective sources. However, it is assumed that SMEs are less documented than their larger colleagues.

- Purpose: Raising awareness

  The purpose of using the maturity model is to assess and identify improvements, by recognising deficiencies, creating willingness to act and to follow through on the findings. This is perfectly in line with the research question.

- Architecture type: Both

  Architecture type concerns whether the maturity model defines a road map - which explains how to reach each consecutive level - per capability (continuous), a road map for overall maturity (staged), or both. Preferably, the maturity model satisfies both.

Considering the soft constraints (table 4), the following three BPMMS are selected out of the remaining eight models:

1. Process and Enterprise Maturity Model (PEMM), Hammer M., 2007 (HAM)
2. Business Process Orientation Maturity Model (BPO-MM), McCormack K. & Johnson W.C., 2001 (MCC)
3. Business Process Maturity Model (BPMM), Fisher D.M., 2004 (FIS)

Table 4: Soft constraints of maturity models based on Smart-Selector (Van Looy et al., 2013)

	HAM - PEMM	MCC - BPO	FIS - BPMM
Validation	Yes, for application	Yes, for application & outcomes	No
Nr. of assessment items	26	11	5
Capabilities	Basic + Culture + Structure	Basic	Basic + Culture
Collection technique	Only subjective	Only subjective	Only subjective
Purpose	Raising awareness	Raising awareness + benchmarking	Raising awareness
Architecture type	Only staged	Both	Both

4.2.2 Description of the selected Maturity Models

The three selected models are displayed and compared in table 5. Each model will be elaborated in the following paragraphs, by following the structure of the table. The complete models can be found in Appendix (Exhibit 2).

Table 5: Maturity models (based on Hammer, 2007; McCormack & Johnson, 2001; Fisher, 2004)

Maturity model	Hammer – PEMM	McCormack – BPO	Fisher – BPMM
Maturity questionnaire	Per AI: description of statement for levels 1 to 4 & colour code; Green: largely true Yellow: somewhat true Red: largely untrue	Per AI: question based on five-point Likert scale (strongly disagree - strongly agree)	Per AI: description of statement for levels 1 to 5
Maturity scale	0-4	1-5	0-5
Maturity stages	4 Enterprise maturity / Process maturity - E-1 / P-1: Reliable and predictable - E-2 / P-2: Superior results - E-3 / P-3: Optimal Performance - E-4 / P-4: Best-in-class	4 - Ad hoc (score ≤ 2) - Defined (2 < score ≤ 3) - Linked (3 < score ≤ 4) - Integrated (score ≥ 4)	5 - Siloed - Tactically integrated - Process driven - Optimised enterprise - Intelligent operating network
Maturity calculation	Min. score for the yellow colour code among all AIs	Aggregating and averaging the scores	Lowest scoring marked cell for all AIs
Assessment items (AI)	= Subcategories (26)	= Subcomponents (11)	= Levers of change (5)
BPM categories	= E - capabilities & P - enablers * Enterprise capabilities - Leadership - Culture - Expertise - Governance * Process enablers - Design - Performers - Owner - Infrastructure - Metrics	= BPO components - Process View (PV) - Process Jobs (PJ) - Process Management & Measurement Systems (PM)	= Levers of change - Strategy - Controls - People - Technology - Process

4.2.2.1 Hammer – PEMM

The Process and Enterprise Maturity Model (PEMM) was developed by Michael Hammer (2007), known as one of the founders of Business Process Reengineering (BPR). Taking his reputation as a thought leader in the field into account and the fact that the model connects several other maturity models available, the PEMM is a recommended as a safe choice when conducting a process management assessment (Power, 2007).

The **maturity questionnaire** consists of four statements for each assessment item, which have to be estimated as largely true (green), somewhat true (yellow) or largely untrue (red). As each statement elaborates on the previous one, it is not possible to assign a green colour to a cell following a yellow- or red-coloured statement, nor a yellow colour to a cell following a red-coloured statement. The composition of the model is twofold. On the one hand, the maturity of the processes is analysed. On the other hand, the maturity of the entire enterprise is determined. Each statement corresponds to a **maturity stage**: P-1/E-1 stands for reliable and predictable, P-2/E-2 for delivering superior results, P-3/E-3 for an optimal performance and P-4/E-4 for a best-in-class result. A company that has not reached P-1 or E-1 is at the P-0 or E-0 level, but this is not considered as a maturity stage in itself. As the enterprise level indicates whether the company provides a supporting environment for the processes, the process level can never be higher than the enterprise level. In terms of **maturity calculation**, the process or enterprise can be said to be at a certain level, respectively from P-1 to P-4 and E-1 to E-4, when all subcategories have at least reached that level. In the application of the model in this thesis, a level is considered as reached when the answer is somewhat true (yellow) or largely true (green). When completed, one can immediately locate the roadblocks which retain the company from reaching a better strength level. An example of how the model should be completed for one main category can be found in figure 2. The entire model can be found in Appendix (Exhibit 2.1).

How Mature Is Your ENTERPRISE?		Make an estimation about the following statements	**Green** Largely true: > 80%	**Yellow** Somewhat true: 20%-80%	**Red** Largely untrue: < 20%	E-1	E-2	E-3	E-4
		E-1	E-2	E-3	E-4				
Leadership	Awareness	Statement 1	Statement 2	Statement 3	Statement 4				
	Alignment	Statement 1	Statement 2	Statement 3	Statement 4				
	Behavior	Statement 1	Statement 2	Statement 3	Statement 4				
	Style	Statement 1	Statement 2	Statement 3	Statement 4				

Figure 2: Example of a main category of PEMM (based on Hammer, 2007)

The model consists of 26 **assessment items** subdivided in 9 main **BPM categories**. Hammer (2007) distinguished four so-called enterprise capabilities, namely *Leadership*, *Culture*, *Expertise* and *Governance*, again subdivided in three to four subcategories (table 6). To make an examination at the process level, the model considers five process enablers, namely *Design*, *Performers*, *Owner*, *Infrastructure* and *Metrics*, each subdivided in two or three subcategories (table 7).

Table 6: Description (sub)categories Enterprise Capabilities PEMM (based on Hammer, 2007)

Enterprise capabilities		
Category	**Subcategory**	**Explanation**
Leadership Extent to which senior executives support the importance of processes.	**Awareness**	Measures how the senior executive team perceives and acknowledges the power of processes.
	Alignment	Concentrates on who takes the leadership over the process program (senior executives, middle management, employees).
	Behavior	Checks whether the senior executive team invests in operational improvements and manages the company through processes.
	Style	Focuses on how the senior executives manage the company and delegate control and authority to employees.
Culture How individuals behave toward customers and toward one another.	**Teamwork**	Measures how far teamwork goes within the company (project focused, cross-functional, with customers and suppliers, etc.).
	Customer Focus	Checks the extent to which employees are concerned with the value delivered to the customer.
	Responsibility	Gives an idea of the accountibility the personnel takes for enterprise results.
	Attitude change	Indicates how employees are believed to react toward change initiatives.
Expertise Skills in process redesign within the existing workforce.	**People**	Determines how skilled the current workforce is in process redesign and change management.
	Methodology	Questions whether the company has certain methodologies for solving problems or redesigning processes.
Governance Procedures to manage change initiatives and complex projects.	**Process Model**	Checks if the company has identified business processes and how they are communicated toward stakeholders.
	Accountability	Gives an overview of who is accountible for performance, improvement projects, individual processes, etc.
	Integration	Considers whether there is a coordinating body within the company which is concerned with process improvement efforts.

Table 7: Description (sub)categories Process Enablers PEMM (based on Hammer, 2007)

Process Enablers		
Category	**Subcategory**	**Explanation**
Design Comprehensiveness of the way the process should be executed.	**Purpose**	Defines the extent to which the process has been designed to optimise performance and to fit with other processes.
	Context	Finds out how aware the company is of the external factors to their processes and the performance expectations.
	Documentation	Questions whether the business process(es) are documented and linked to the enterprise's systems and data architecture.
Performers The employees that carry out the process.	**Knowledge**	Gives an idea of the extent to which employees know the process and its impact on enterprise performance.
	Skills	Checks whether process operators are good at solving problems, working in team and decision making.
	Behavior	Gives a notion of how broadly employees view their jobs, namely if they look further than their own function.
Owner (Senior) executive who is responsible for the process and its results.	**Identity**	Checks whether there is a process owner role within the company and how advanced this role is.
	Activities	Indicates if the process owner has a certain vision for the future of the process and makes strategic decisions based on this.
	Authority	Defines to what extent the process owner can influence other people within the organisation to make changes to the process.
Infrastructure IT and management systems supporting the process.	**IT Systems**	Finds out which IT systems are used and what the main functionalities are.
	HR Systems	Checks the alignment between the HR-related tasks (hiring, development, rewarding, etc.) and the process's design.
Metrics The company's process performance measures.	**Definition**	Concentrates on finding out whether the process performance is measured and to what extent it is measured.
	Uses	Checks how the process's metrics are used in improving the performance of processes and influences strategic initiatives.

4.2.2.2 McCormack – BPO

The Business Process Orientation Maturity Model (BPO) (McCormack & Johnson, 2001) is created by academics K. McCormack and W.C. Johnson. Developed in 2001, it is the oldest maturity model suggested by the Smart-Selector. It is one of the most referred to maturity models in literature, and it forms the base of a lot of subsequent maturity models. Its application in a business environment is tested numerous times (Tarhan *et al.*, 2016), which makes it one of the most well-known models in the BPM community.

The model consists of a **maturity questionnaire**, in which the BPO level of an enterprise is measured. A five-point Likert scale is used to measure the agreement with a question, ranging from completely disagree to completely agree. The BPO assessment consists of a four-step path for systematically advancing business processes; the so called BPO levels (=**maturity stages)**: Ad hoc, Defined, Linked, Integrated (Skrinjar *et al.*, 2008). The stages are briefly defined at the end of this paragraph, and displayed in figure 3. The **maturity calculation** is done by aggregating and averaging the scores for the different AIs. A score lower than 2 means the BPO level is Ad hoc, scores between 2 and 3 represent the Defined level, the Linked level contains scores between 3 and 4, while scores of 4 or higher are necessary to reach the Integrated level. Each maturity level builds on the previous levels to become more business process oriented (Skrinjar *et al.*, 2008). The questionnaire is composed of eleven questions (=**assessment items**), divided over three BPO components (=**BPM categories**); *Process View* (PV), *Process Jobs* (PJ) and *Process Management and Measurement Systems* (PM);

Process View: "This dimension refers to the understanding and clear view that everyone in the organisation needs to have on the organisation's processes. To establish such a common process view, it is critical that processes are well identified, defined and documented and that this information is available to any employee in the organisation. It allows people in different job functions to communicate using the same vocabulary." (McCormack, 2007) In the BPO questionnaire, three questions assess the PV of the enterprise.

Process Jobs: "Process Jobs comprise job strategies that consist of empowered, multidimensional, process team-oriented jobs." (McCormack & Johnson, 2001) "These jobs include horizontal (cross-functional) rather than vertical responsibility." (McCormack, 2007) Three questions are used in the BPO questionnaire to assess the PJ of an organisation.

Process Measurement and Management Systems: "PM refers to process measurement systems, rewards for process improvement and outcome measurements." (McCormack & Johnson, 2001) Five questions gauge the PM of the enterprise in the BPO questionnaire.

According to McCormack and Johnson (2001), PM is the most important BPO component, followed by PJ. They state that PV just provides a base that can be used to organise jobs (PJ) and process measures (PM) (McCormack & Johnson, 2001). It can be said that PV forms the foundation for everything else that needs to be built to become Business Process Oriented (McCormack & Johnson, 2001).

For the BPO levels, the following definitions apply;

Ad Hoc (score ≤ 2): "The processes are unstructured and ill-defined. Process measures are not in place and the jobs and organisational structures are based upon traditional functions, not horizontal processes." (McCormack & Johnson, 2001)

Defined (2 < score ≤ 3): "The basic processes are defined and documented. Changes to these processes must now undergo a formal procedure. Jobs and organisational structures include a process aspect, and yet remain basically functional. Representatives from functional areas (sales, manufacturing, etc.) have regular meetings to coordinate with each other, but only as representatives of their traditional functions." (McCormack & Johnson, 2001)

Linked (3 < score ≤ 4): "The breakthrough level. Managers employ process management with strategic intent and results. Broad process jobs and structures are put in place outside the traditional functions." (McCormack & Johnson, 2001)

Integrated (score ≥ 4): "The company, its vendors and suppliers, take cooperation to the process level. Organisational structures and jobs are based on processes, and traditional functions begin to be equal or sometimes subordinate to the processes. Process measures and management systems are deeply embedded in the organization." (McCormack & Johnson, 2001)

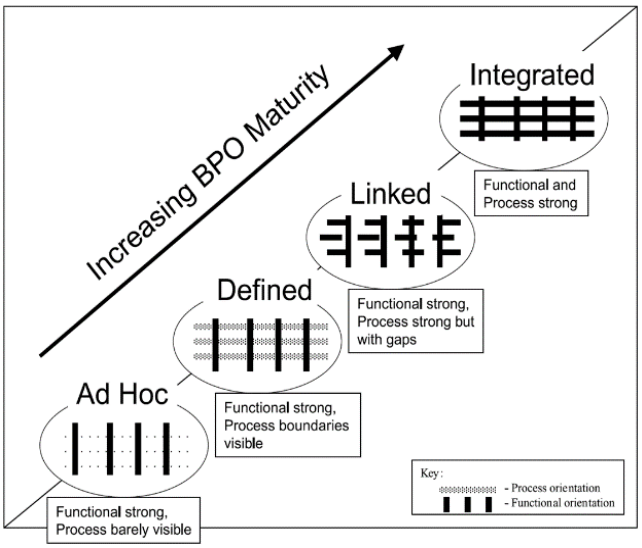


Figure 3: BPO Maturity Levels (McCormack & Johnson, 2001)

The entire model can be found in Appendix (Exhibit 2.2).

4.2.2.3 Fisher – BPMM

Fisher's Business Process Maturity Model dates from 2004 (Fisher, 2004). David M. Fisher, managing director of BearingPoint (a multinational management and technology consulting firm), created the model, together with BearingPoint colleagues. The model tries to provide a balance between a simple representation everybody can easily understand and use, and a model that contains sufficient detail to provide insights for specific action points (Fisher, 2004).

The **maturity questionnaire** consists of five statements for each assessment item. For each item, the most appropriate statement for the specific organisation has to be selected. Per assessment item, each statement builds on the previous one and corresponds to a **maturity stage**. Five stages are defined; Siloed, Tactically Integrated, Process Driven, Optimised Enterprise and Intelligent Operating Network. The **maturity calculation** goes as follows: the maturity can be said to be at a certain stage, when all subcategories have at least reached that stage. As a result, the lowest scoring marked statement determines the maturity level. The model is structured around five **assessment items**; the so-called five levers of change (=**BPM categories**, since each BPM category consists of only one AI). These levers verify the BPM development in a specific domain; *Strategy*, *Controls*, *People*, *Technology* and *Process*. The key to these levers is alignment. When consistent alignment across all five levers is achieved, the organisation is operating at a level where it can achieve optimal results. However, consistent alignment is rarely the case. If one lever is running behind, this will inhibit the ability to achieve the benefits that could be achieved if all levers would be at the same level (Fisher, 2004).

The Five levers of change are briefly described below.
Strategy: "Strategic understanding of the role, positioning and focus for enterprise-wide decision-making in support of overall company objectives." (Fisher, 2004)
Controls: "The governance model for the management, administration, and evaluation of initiatives, with a strong focus on the appropriate metrics applied for measurement." (Fisher, 2004)
People: "The human resource environment, including skills, organisational culture, and organisational structure." (Fisher, 2004)
Technology: "Enabling information systems, applications, tools, and infrastructure." (Fisher, 2004)
Process: "Operating methods and practices, including policies and procedures, which determine the way activities are performed." (Fisher, 2004)

The entire model can be found in Appendix (Exhibit 2.3).

4.3 **Step 3**: Fine-tuning of the Maturity Models

In order to fine-tune the proposed maturity models, an interview with the executive leadership of each SME was conducted. In this interview, the purpose of the study was explained, and an introduction to BPM was provided. Next, the researchers considered some aspects from the models described in the previous step (HAM - PEMM, MCC - BPO and FIS - BPMM) together with the leadership of the SME. The researchers drafted some specific questions concerning the different (sub)categories of the models. In this way, AIs irrelevant to examine in SMEs can be omitted. This resulted in a **first fine-tuning step.**

In section 4.4 (*Step 4: Application of the Maturity Models*), the fine-tuned models are used to determine the maturity levels of the three enterprises. Per case, the distinction will be made between the upper management (i.e. (the) general manager(s) who run(s) the business) and the lower management (i.e. other people with a form of decision making authority in the enterprise, e.g. sales manager). The maturity of the former was assessed during an interview, guided by the researchers. The latter assessed the maturity of their respective enterprise through a questionnaire. Therefore, the models were adapted again in a **second fine-tuning step** for the lower management.

Given the assessed SMEs were all Belgian, the researchers went through the effort of translating the models before collecting the data. This provided an opportunity to word complex terminology somewhat differently to enhance understandability for the respondents as well.

4.3.1 Hammer - PEMM

In the **first fine-tuning step**, the researchers identified the assessment elements in the maturity models which are considered to be irrelevant for SMEs together with the upper management of each company. Some categories or statements that are applicable in larger companies may be of little importance to the SME. It should be stated that this must be critically assessed as well. While a certain element may not seem relevant at the time for the organisation because it has never been considered, it might be something that could deliver benefits after all. The assessment items are presented as follows throughout the remainder of the thesis: Main category-Subcategory (cf. table 6 and 7).

Of the 26 subcategories, there were 4 constructs which did not seem relevant to all three interviewed company leaders. First, they all mentioned that Expertise-Methodology is currently not relevant. There are no real methodologies in place for problem solving or process redesign. These things are all done ad hoc without a specific pattern. Company leaders and employees mostly rely on their personal experience when confronted with certain issues. Next, the construct Governance-Accountability was categorised redundant to the survey. The main reason for this was that the accountability for enterprise performance, improvement projects and individual processes all comes down to the upper management. SMEs mostly

have a rather flat structure and lack resources to integrate certain roles, such as functional managers, projects managers or process owners. A third subcategory that is difficult to address within the three assessed SMEs is Governance-Integration. The reason is almost the same as with accountability, namely the lack of resources to compose a group of employees burdened with process improvement tasks. A final construct that was not seen as relevant to the considered SMEs was Infrastructure-HR systems, namely the alignment between the design of the processes and the company's HR policy. SMEs tend not to have extremely complex processes. For this reason, job trainings are usually not based on process documentation, but rather on learning by doing and working along more experienced employees. When hiring, job descriptions and role definitions are not necessarily driven by the process's design, rather by personal and technical skills.

Next, 6 of the 26 subcategories were omitted in the **second fine-tuning step**. As the survey takes a certain amount of time to fill out, it stands to reason that the more concise it is, the smaller the effort will be for the respondents to complete it. The criteria for omitting certain constructs were twofold. First, as certain subcategories can be answered objectively, there is no real value in presenting them to the lower management since the upper management already answered them (e.g. metrics are in place or they are not). Due to this criterion, three categories were left out, namely Infrastructure-IT systems**,** Metrics-Definition and Metrics-Uses. Second, three of the subcategories under leadership can only be assessed by the upper management. These constructs are Leadership-Awareness, Leadership-Alignment and Leadership-Behaviour. As these subcategories only appeal to the company leadership, they are the only ones who can answer these questions truthfully.

To conclude, the PEMM consists of 26 constructs, from which 22 were filled out by the upper management and 16 by the lower management given the reasons mentioned in this section.

4.3.2 McCormack - BPO

As this model is rather straightforward, no questions seemed to be irrelevant to SMEs at first. Based on the interview, the researchers did not omit any elements from the model and only worded complex terminology differently to make it more comprehensible to the people who needed to fill it out. This makes the distinction between the **first** and the **second fine-tuning step** redundant.

4.3.3 Fisher - BPMM

When attempting to fine-tune Fisher's model, the researchers noticed that the five levers of change reveal many similarities with the Process Enablers and Enterprise Capabilities reviewed in the Hammer model. As the latter model is more elaborated than the former (cf. number of assessment items and capabilities), the researchers examined whether these levers of change can be found within the PEMM.

The levers of the Fisher model are indicated in bold, while Hammer's Process Enablers and Enterprise Capabilities are underlined.

For a start, **Controls** is determined by the categories Governance, Metrics, and Leadership for a part, which is in accordance with the definition (cf. supra). A second lever is **People**, which is extensively questioned in the PEMM. Four categories examine this area, namely Culture, Performers, Owner and Expertise. Further, there is the **Technology** part. PEMM's category Infrastructure, more specifically the subcategory IT systems makes sure this is not overlooked. Finally, there is the lever **Process**. This is measured in the PEMM by the only remaining category that questions the process's development and documentation, which is Design.

The only lever which is hardly captured by the Hammer model is **Strategy.** The subcategory Leadership-Awareness and Governance-Process model capture this lever partly. The Awareness subcategory assesses the leadership's notion of the power of business processes, while Process model gauges to the degree of integration of the different processes throughout the enterprise (cf. supra). However, in terms of strategic alignment, which requires a tight linkage between the overall strategy and the business processes (Rosemann & vom Brocke, 2015), the researchers notice that Hammer's model falls short. This is problematic, since strategic alignment is one of the core elements of a successful BPM implementation (Rosemann & vom Brocke, 2015). This finding is supported by Power, who states that Hammer's model is not able to assess the alignment between process improvement activities, and the organisation's priorities, values, and design of operations (Power, 2007).

In conclusion, four of the levers of change found in FIS can almost be entirely determined by the PEMM. Unfortunately, the fifth lever Strategy is hardly captured. Given the limited added value of FIS over Hammer's PEMM, the researchers decided not to include this model. This is a well-considered trade-off between added value and additional effort for the SMEs deliberately made by the researchers. The fact that the FIS was not yet empirically validated played a role in this decision as well. As a result, the fine-tuning of this model becomes redundant.

4.4 **Step 4**: Application of the Maturity Models

For every SME considered, the models obtained from the previous step (HAM-PEMM and MCC-BPO) are applied to determine the BPM maturity level during a second meeting with each SME. Ideally, the maturity level is assessed based on the opinions of people with different functions throughout the enterprise, or at least in consensus. To obtain a valid result, it is important that the right people - those that have a notion about the management of the business processes - take on the assessment.

In this section, the application of the maturity models and the processing of the data is described - per maturity model - on a case-by-case level first: the **intracompany** analysis. Per case, the distinction is made between upper and lower management, as depicted in table 8. For the upper management, the maturity level was assessed during an interview. Interviewing the lower management however would be too time-consuming. That is why a survey was used to assess the maturity from the perspective of the lower management. Besides describing the results of both categories separately, the researchers also compared them to detect similarities and discrepancies in the gathered data.

Table 8: Respondents of maturity questionnaire

Mgmt. SMEs	Upper Mgmt.	Lower Mgmt.
Fero	CEO COO	Head of accountancy Head of after sales service Warehouse manager S&M manager Project manager
Vossaert	Manager 1 Manager 2	Head of calculation Head of technical design Technical designer
Maes	CEO	Head of service dept. Rep. of technicians Warehouse responsible Project manager

After having reported the intracompany results, a comparison is made between the three cases to detect certain **intercompany** patterns in the data. As there are only three different companies described in this research, it is not possible to derive statistical significant conclusions. However, the findings in this section might deliver valuable insights and provide a basis for further research. For this intercompany comparison, the data of the upper management is used. They are assumed to be the people within the SMEs with the most high-level view of the company. This makes their data trustworthy to use as a benchmark for comparing the different case studies. It is assumed that the lower management often does not have this high-level helicopter view of the company.

The detailed analysis for both maturity models (HAM-PEMM and MCC-BPO) can be found in Appendix (Exhibit 3 and 4). This section covers the main findings.

4.4.1 Hammer - PEMM

To process the data from the PEMM, the researchers first attempted to accomplish this in the **qualitative** manner proposed by Hammer and described in section 4.2.2.1 (*Hammer-PEMM*). However, this did not deliver satisfying results. The maturity level of the main categories was solely determined by the lowest scoring subcategory, which delivered a distorted image of the situation. Furthermore, the subcategories could only be divided over five maturity levels (E-0 to E-4 or P-0 to P-4). While this is a convenient method to identify specific action areas per SME, as is done in *Step 5: identification of action areas*, this imposed significant limitations on the intra- and intercompany analyses. The qualitative method does not allow to easily determine averages over a group of respondents. Comparing the results of upper and lower management as well as over the three case studies required a more numerical approach.

The researchers devised a number key in order to perform a **quantitative** assessment. As the respondents had to answer in a colour code, a number was assigned to each colour. The green cells (completely agree) were assigned number 2, the yellow cells (partly agree) number 1 and the red cells (completely disagree) got the number 0. Next, the average score was calculated over the four statements, so each subcategory ended up with a score between 0 and 2, with 2 being the highest form of attention to a certain category and 0 being the lowest. Then, these scores are sorted from high to low to distinguish the strongest and the weakest scoring subcategories. This is done by composing a boxplot of the results, whereby subcategories scoring ≥ Quartile 3 (Q3) represent the most intensively addressed constructs and the subcategories scoring ≤ Quartile 1 (Q1) the ones that require attention. As this model has to be completed in a specific way (cf. supra), all responses that did not comply with the model's requirements were left out to avoid mistakes.

This part breaks down as follows. First, the intracompany comparison is made between the answers of the upper and lower management for each company separately. It stands to reason that a comparison between the scores for both groups can only be made for the subcategories filled out by the lower management as they received a shortened version. The objective constructs (Awareness, Alignment, Behaviour (leader), IT systems, Definition and Uses) are only answered by the upper management, thus cannot be compared within the companies. Hence, instead of the 22 subcategories filled out by the upper management, only 16 constructs are compared. Based on the quartiles Q1 and Q3, the researchers look for returning subcategories amongst the stronger and weaker scoring groups. Next, discrepancies in the scores are exposed. To do this, the scores for each subcategory from the upper management are subtracted from the ones of the lower management to detect where the largest differences of opinion are concerning the interpretation of the statements. At the end, an intercompany comparison is made between the different assessed companies based on the data provided by the upper management.

4.4.1.1 Fero

Table 9: Scores subcategories PEMM Fero

Lower Management	
Teamwork	1,88
Responsibility	1,63
Behaviour	1,56
Knowledge	1,40
Customer Focus	1,35
Activities	1,30
Authority	1,15
Purpose	1,13
Identity	1,13
Context	1,06
Process Model	1,05
Skills	0,94
People	0,90
Attitude change	0,75
Documentation	0,55
Style	0,38

Upper Management	
Purpose	1,75
Style	1,50
Responsibility	1,50
Customer Focus	1,25
Context	1,25
Knowledge	1,25
Behaviour	1,25
People	1,00
Authority	1,00
Attitude change	0,75
Skills	0,75
Identity	0,75
Teamwork	0,50
Process Model	0,50
Documentation	0,00
Activities	0,00

Returning subcategories (table 9):

≥ Q3:

- Culture-Responsibility
- Performers-Knowledge
- Performers-Behaviour

≤ Q1:

- Design-Documentation

Discrepancies:

The three most notable differences in results are found in the subcategories Teamwork, Activities and Style. Culture-Teamwork (table 10) is perceived by the lower management as a common phenomenon, while the upper management does not believe so. Moreover, it is the highest scoring category for the former, while it can be found below the lower quartile for the latter (table 9). The same is true for Owner-Activities (table 10), which questions whether there is a clear vision for the future of the processes. For the subcategory Leadership-Style (table 11), the belief is reversed. While the people in higher positions are convinced the company is managed in a collaborative way in which authority and control is delegated to employees, the lower ranked people do not entirely believe so. Contrary to the subcategory Teamwork, Style is the lowest scoring category for the lower management, while being amongst the top constructs for the upper management (table 9).

Table 10: Higher scores lower management PEMM (Fero)

	Lower		Upper		Diff.
Teamwork	1,88	-	0,50	=	1,38
Activities	1,30	-	0,00	=	1,30
Process Model	1,05	-	0,50	=	0,55
Documentation	0,55	-	0,00	=	0,55

Table 11: Higher scores upper management PEMM (Fero)

	Lower		Upper		Diff.
People	0,90	-	1,00	=	-0,10
Context	1,06	-	1,25	=	-0,19
Purpose	1,13	-	1,75	=	-0,63
Style	0,38	-	1,50	=	-1,13

4.4.1.2 Vossaert Kitchens-Interior

Table 12: Scores subcategories PEMM Vossaert

Lower Management	
Customer Focus	1,58
Purpose	1,58
Responsibility	1,50
Knowledge	1,50
Context	1,42
Behaviour	1,42
Process Model	1,38
Identity	1,25
Skills	1,17
Activities	1,13
People	1,00
Documentation	1,00
Attitude change	0,92
Authority	0,88
Teamwork	0,67
Style	0,50

Upper Management	
Purpose	1,75
Context	1,63
Authority	1,38
Knowledge	1,13
Identity	1,00
Style	0,88
Responsibility	0,75
Process Model	0,75
Behaviour	0,75
Skills	0,75
People	0,63
Customer Focus	0,25
Attitude change	0,25
Teamwork	0,25
Activities	0,25
Documentation	0,13

Returning subcategories (table 12):

≥ Q3:

- Design-Purpose
- Performance-Knowledge

≤ Q1:

- Culture-Attitude toward change
- Culture-Teamwork

Discrepancies:

It can be immediately derived from table 13 and 14 that the differences between the scores are larger where the lower management has given the higher scores. The largest difference is found for Culture-Customer Focus (table 13). While the upper management believes that the employees can do a better job concerning about value delivered to the customer and positions this below the lower quartile, the lower management is very optimistic about the way customer value is addressed within the company, attributing the highest score to the category (table 12). For Owner-Activities (table 13), lower management indicates that there is a process owner who has a vision about the process, while the upper management denies this. The same is true for Design-Documentation (table 13). While lower management answers there is end-to-end documentation, the upper management says there is none. Owner-Authority (table 14) on the other hand is placed above the upper quartile for the upper management and below the lower quartile for the lower management (table 12). This subcategory entails the way the process owner can influence other people within the organisation to make certain changes to the process.

Table 13: Higher scores lower management PEMM (Vossaert)

	Lower		Upper		Diff.
Customer Focus	1,58	-	0,25	=	1,33
Activities	1,13	-	0,25	=	0,88
Documentation	1,00	-	0,13	=	0,88
Responsibility	1,50	-	0,75	=	0,75

Table 14: Higher scores upper management PEMM (Vossaert)

	Lower		Upper		Diff.
Purpose	1,58	-	1,75	=	-0,17
Context	1,42	-	1,63	=	-0,21
Style	0,50	-	0,88	=	-0,38
Authority	0,88	-	1,38	=	-0,50

4.4.1.3 Maes Compressors

Table 15: Scores subcategories PEMM Maes

Lower Management	
Teamwork	1,83
Customer Focus	1,75
Behaviour	1,69
Style	1,50
People	1,44
Responsibility	1,42
Context	1,38
Purpose	1,38
Skills	1,38
Authority	1,31
Knowledge	1,31
Activities	1,19
Process Model	1,13
Attitude change	1,06
Identity	0,94
Documentation	0,25

Upper Management	
Style	2,00
Teamwork	2,00
Customer Focus	2,00
Responsibility	2,00
Activities	2,00
Purpose	1,75
Behaviour	1,75
Context	1,50
Authority	1,50
People	1,25
Process Model	1,25
Documentation	1,25
Skills	1,00
Identity	1,00
Knowledge	0,50
Attitude change	0,25

Returning subcategories (table 15):

≥ Q3:

- Culture-Teamwork
- Culture-Customer Focus
- Leadership-Style

≤ Q1:

- Culture-Attitude toward change
- Owner-Identity

Discrepancies:

In this case, there are two subcategories to which the lower management attributed significantly higher scores, namely Culture-Attitude toward change and Performers-Knowledge (table 16). The company leadership does not believe that employees are ready for change initiatives or have a broad view of the process and the way it impacts the enterprise performance. The next discrepancy is found for Design-Documentation (table 17). While the upper management ensured the researchers that there is documentation of the process, the lower management does not believe so. For Owner-Activities (table 17), the upper management was very optimistic and attributed the highest possible score, while the lower management was somewhat more reserved.

Table 16: Higher scores lower management PEMM (Maes)

	Lower		Upper		Diff.
Knowledge	1,31	-	0,50	=	0,81
Attitude change	1,06	-	0,25	=	0,81
Skills	1,38	-	1,00	=	0,38
People	1,44	-	1,25	=	0,19

Table 17: Higher scores upper management PEMM (Maes)

	Lower		Upper		Diff.
Style	1,50	-	2,00	=	-0,50
Responsibility	1,42	-	2,00	=	-0,58
Activities	1,19	-	2,00	=	-0,81
Documentation	0,25	-	1,25	=	-1,00

4.4.1.4 Comparison

Comparing the results across the three SMEs is done by composing a general ranking based on the results of the PEMM (sub)categories for the upper management. In this manner, the strongest and weakest scoring components in general can be determined and reflected upon.

Ranking subcategories

To compose a general ranking of the different subcategories, the individual rankings of each subcategory are determined per SME (table 18). Subcategories with equal scores are attributed the same ranking. For instance, there are three subcategories with rank 1 at Fero, as they all have the same score. Consequently, ranks 2 and 3 are skipped and the fourth highest scoring construct receives rank 4. These individual rankings are then added up to determine the sum of the ranks of the three SMEs. Finally, these values are sorted from low to high, representing the general ranking of the subcategories relative to each other. The researchers deliberately decided not to compose an absolute ranking based on the scores, because certain people may be tempted to give more extreme scores than others, whereby influencing the general ranking more significantly.

As can be seen from table 18, the subcategories that are developed the most in these companies are: **Infrastructure-IT systems, Leadership-Awareness, Leadership-Style, Design-Purpose, Design-Context and Culture-Responsibility**. The subcategories which need the most attention can also be derived, namely Governance-Process model, Performers-Skills**,** Culture-Attitude toward change, Metrics-Uses, Design-Documentation and Metrics-Definition.

Table 18: General ranking subcategories over the three case studies based on the upper mgmt.

Rankings	Fero	Maes	Vossaert	Sum Ranks	Average Rank
Awareness	1	1	1	3	**1**
Purpose	1	8	2	11	**2**
Style	4	1	8	13	**3**
Responsibility	4	1	9	14	**4**
IT Systems	4	11	4	19	**5**
Context	7	11	2	20	**6**
Behaviour (Leader)	7	1	14	22	**7**
Customer Focus	7	1	15	23	**8**
Behaviour (Perform)	7	8	9	24	**9**
Authority	12	11	5	28	**10**
Alignment	1	8	20	29	**11**
Knowledge	7	20	6	33	**12**
Teamwork	17	1	15	33	**12**
Activities	21	1	15	37	**14**
Identity	14	18	7	39	**15**
People	12	14	13	39	**15**
Process Model	17	14	9	40	**17**
Skills	14	18	9	41	**18**
Attitude change	14	22	15	51	**19**
Uses	19	14	20	53	**20**
Documentation	21	14	19	54	**21**
Definition	19	20	20	59	**22**

The ranking enables the researchers to situate the most and least developed subcategories in general on the ranking of the individual companies. The highest ranking subcategories over the three SMEs are indicated in bold, the lowest ranking ones are underlined (table 19).

Most developed: **Infrastructure-IT systems, Leadership-Awareness, Leadership-Style, Design-Purpose, Design-Context and Culture-Responsibility**

Underdeveloped: Governance-Process model, Performers-Skills, Culture-Attitude toward change, Metrics-Uses, Design-Documentation and Metrics-Definition.

Table 19: Situating general most and least developed subcategories at individual companies

Fero	
Awareness	1,75
Alignment	1,75
Purpose	1,75
Style	1,50
Responsibility	1,50
IT Systems	1,50
Behaviour (Perform)	1,25
Customer Focus	1,25
Context	1,25
Knowledge	1,25
Behaviour (Leader)	1,25
People	1,00
Authority	1,00
Attitude change	0,75
Skills	0,75
Identity	0,75
Teamwork	0,50
Process Model	0,50
Definition	0,25
Uses	0,25
Documentation	0,00
Activities	0,00

Vossaert	
Awareness	1,75
Purpose	1,63
Context	1,63
IT Systems	1,50
Authority	1,38
Knowledge	1,13
Identity	1,00
Style	0,88
Responsibility	0,75
Process Model	0,75
Skills	0,75
Behaviour (Perform)	0,75
People	0,63
Behaviour (Leader)	0,50
Teamwork	0,25
Customer Focus	0,25
Attitude change	0,25
Activities	0,25
Documentation	0,13
Alignment	0,00
Definition	0,00
Uses	0,00

Maes	
Awareness	2,00
Behaviour (Leader)	2,00
Style	2,00
Teamwork	2,00
Customer Focus	2,00
Responsibility	2,00
Activities	2,00
Alignment	1,75
Purpose	1,75
Behaviour (Perform)	1,75
Context	1,50
Authority	1,50
IT Systems	1,50
People	1,25
Process Model	1,25
Documentation	1,25
Uses	1,25
Skills	1,00
Identity	1,00
Knowledge	0,50
Definition	0,50
Attitude change	0,25

Ranking main categories

The method used to compose a general ranking for the main categories is the same as for the subcategories, based on the individual rankings in the three SMEs.

From table 20, the three most developed categories can be determined; **Infrastructure, Leadership** and **Design**. The three main categories which need the most attention can be derived as well; Expertise, Governance and Metrics.

Table 20: General ranking main categories over the three case studies based on the upper mgmt.

Rankings	Fero	Maes	Vossaert	Sum Ranks	Average Rank
Infrastructure	2	3	1	6	**1**
Leadership	1	1	5	7	**2**
Design	4	3	2	9	**3**
Owner	7	3	3	13	**4**
Performers	3	8	3	14	**5**
Culture	4	2	8	14	**5**
Expertise	4	6	7	17	**7**
Governance	8	6	6	20	**8**
Metrics	9	9	9	27	**9**

Again, this enables the researchers to situate the overall results on the ranking of the individual companies (table 21).

Most developed: **Infrastructure**, **Leadership** and **Design**
Underdeveloped: Expertise, Governance and Metrics

Table 21: Situating general most and least developed main categories at individual companies

Fero		Vossaert		Maes	
Leadership	1,56	**Infrastructure**	1,50	**Leadership**	1,94
Infrastructure	1,50	**Design**	1,17	Culture	1,56
Performers	1,08	Performers	0,88	**Design**	1,50
Culture	1,00	Owner	0,88	Owner	1,50
Expertise	1,00	**Leadership**	0,78	**Infrastructure**	1,50
Design	1,00	Governance	0,75	Expertise	1,25
Owner	0,58	Expertise	0,63	Governance	1,25
Governance	0,50	Culture	0,38	Performers	1,08
Metrics	0,25	Metrics	0,00	Metrics	0,88

Some conclusions can be drawn from the most and least developed main categories (table 20). A first remark is made concerning the high scoring main categories Infrastructure and Leadership. The subcategories IT systems for the process enabler **Infrastructure** and Awareness and Style for the enterprise capability **Leadership** are all present in the most developed subcategories as well (table 18). The questioned SMEs clearly have a leadership who wants to take the company to the next level and are supported by the appropriate IT infrastructure. The question is what keeps them from evolving towards a higher level.

Another interesting category is **Design**. While two of its subcategories, Purpose and Context, both appear in the most developed subcategories, the third subcategory, Documentation ranks second last in the average ranking (table 18). For Fero and Vossaert, Documentation is an action area that is of the highest importance. Both companies are currently at a lower maturity level than Maes, who have already

documented their business processes. This strengthens the statement of McCormack & Johnson (2001) that business processes need to be documented to propose improvements. Regardless of the size of the enterprise, a detailed description of the business processes seems inevitable.

Categories which are lacking entirely are Expertise, Governance and Metrics. Although the leadership wants to move the company to the next level and the infrastructure is present, it seems to be the **Expertise** that is lacking within SMEs. People with skills in process redesign and implementation are not present in the three conducted case studies and if there is someone with the skills, his/her multidimensional job description makes it almost impossible to implement value-adding changes. The reason **Governance** scores rather low is the fact that Process model is one of the least developed subcategories (table 18) and that the two remaining subcategories (Accountability and Integration) were deemed irrelevant by the leadership and consequently left out. Given that the company structure in SMEs is often rather straightforward, this subcategory seems to be rather underdeveloped. The least developed category is **Metrics**. Both subcategories, Definition and Uses, are almost non-existing and can be found amongst the least developed subcategories as well. As processes are not documented, it is difficult to install meaningful metrics aiming to improve these processes. Only at Maes, where documentation can be found, there are certain metrics in place. This might be a sign that documentation should be taken care of before concentrating on metrics.

4.4.2 McCormack - BPO

McCormack's BPO measurement tool assesses the BPO level of an enterprise in a different way than the PEMM. Since the model only consists of eleven questions, which have to be answered on a five-point Likert scale, one does not have to apply a number key to the assessment items as was the case for PEMM. One can just use the direct answers of the respondents to analyse the maturity of the enterprise. To visually distinguish the eleven subcomponents (AIs) belonging to the main components PJ, PV and PM, the colour code depicted in figure 4 is used. This colour code only applies to the written subcomponents. For its numerical score, conditional formatting is used to denote the BPO scores of the subcomponents relative to each other, ranging from red (= score of 1) to green (= score of 5).

Colour Key AIs
PJ
PV
PM

Figure 4: Colour key used for MCC-BPO analysis

This part is organised analogous to the previous model. Based on the maturity assessment by the SME's upper management, a general BPO level is derived for the company. Next, the results from the upper management are compared to those of the lower management of the enterprise to identify remarkable similarities and discrepancies (intracompany comparison). Analogous to the PEMM, the upper and lower quartiles of the ranked BPO subcomponent scores are used to detect the most striking similarities. Discrepancies are found by subtracting the two scores from each other. After having analysed the maturity case-by-case, the three cases are compared based on the scores of the upper management: the intercompany comparison. Again, only the main findings are covered. The complete analysis can be found in Appendix (Exhibit 4).

4.4.2.1 Fero

General BPO level:

Table 22: General BPO level Fero

BPO Fero	Upper Mgmt.
Process View	3,33
1 The average employee views the business as a series of linked processes.	5,00
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00
3 The business processes are suffiently defined so that most employees know how they work.	4,00
Process Jobs	3,33
4 Jobs are usually multidimensional and not just simple tasks.	4,00
5 Jobs include frequent problem solving.	4,00
6 Employees are constantly learning new things on the job.	2,00
Process Management & Measurement Systems	1,80
7 Process performance is measured.	2,00
8 Process measurements are defined.	2,00
9 Resources are allocated based on process.	3,00
10 Specific process performance goals are in place.	1,00
11 Process outcomes are measured.	1,00
Total Score	2,82

Returning subcomponents:

≥ Q3: AIs 3 & 5

≤ Q1: AIs 10 & 11

Table 23: Scores BPO subcomponents upper management Fero

	Upper Mgmt.	Ranking
1 The average employee views the business as a series of linked processes.	5,00	1
3 The business processes are suffiently defined so that most employees know how they work.	4,00	2
4 Jobs are usually multidimensional and not just simple tasks.	4,00	2
5 Jobs include frequent problem solving.	4,00	2
9 Resources are allocated based on process.	3,00	5
6 Employees are constantly learning new things on the job.	2,00	6
7 Process performance is measured.	2,00	6
8 Process measurements are defined.	2,00	6
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00	9
10 Specific process performance goals are in place.	1,00	9
11 Process outcomes are measured.	1,00	9

Table 24: Scores BPO subcomponents lower management Fero

	Lower Mgmt.	Ranking
5 Jobs include frequent problem solving.	4,60	1
3 The business processes are suffiently defined so that most employees know how they work.	4,00	2
6 Employees are constantly learning new things on the job.	4,00	2
1 The average employee views the business as a series of linked processes.	3,60	4
4 Jobs are usually multidimensional and not just simple tasks.	3,40	5
9 Resources are allocated based on process.	3,40	5
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	3,20	7
7 Process performance is measured.	3,00	8
8 Process measurements are defined.	3,00	8
11 Process outcomes are measured.	2,80	10
10 Specific process performance goals are in place.	2,00	11

Discrepancies:

Table 25: Discrepancies in scores between upper and lower management Fero

	Lower Mgmt.		Upper Mgmt.		Diff.
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	3,20	-	1,00	=	2,20
6 Employees are constantly learning new things on the job.	4,00	-	2,00	=	2,00
11 Process outcomes are measured.	2,80	-	1,00	=	1,80
4 Jobs are usually multidimensional and not just simple tasks.	3,40	-	4,00	=	-0,60
1 The average employee views the business as a series of linked processes.	3,60	-	5,00	=	-1,40

Higher scores lower management: AIs 2, 6 & 11

Higher scores upper management: AIs 1 & 4

The general BPO level of Fero is 2,82 out of 5 (Defined), as displayed in table 22. The PV and PJ are moderately developed, while the PM component is almost non-existing. The most remarkable difference in the perspective of the lower management relative to the upper management relate to AIs 2, 6, 11 and 1, as can be derived from table 25. Lower management perceives that *process terms such as input, output, process, and process owners are used in conversations in the organisation* (AI 2) more than the upper management believes so. The lower management also estimates that *employees are constantly learning new things on the job* (AI 6), and the *process outcomes are measured* (AI 11) more than the upper management thinks. Vice versa, the upper management is absolutely convinced that the *average employee views the business as a series of linked processes* (AI 1) (score of 5), while the lower management agrees, but to a much lesser extent (score of 3,60).

When the rankings of the scores are considered however (table 23 and 24), it stands out that *Process outcomes are measured* (AI 11) is ranked below the lower quartile of both the upper and lower management. Hence, one has to be cautious with interpreting the discrepancy of AI 11 displayed in table 25 and described above. Both managements provide approximately the same ranking of the score of AI 11 relative to the other scores (upper management ranks it last, while upper management ranks it second to last, as described in table 23 and 24). Nevertheless, in the scores themselves, a discrepancy of 1,80 occurs (table 25).

None of the top scoring AIs ($AI \geq Q3$) of the upper management appear among the lowest scoring AIs ($AI \leq Q1$) of the lower management, and vice versa (table 23 and 24). Hence, the discrepancies in scores at Fero are not critical. There are no extreme differences in perspectives for the eleven AIs.

4.4.2.2 Vossaert Kitchens-Interior

General BPO level:

Table 26: General BPO level Vossaert

BPO Vossaert	Upper Mgmt.
Process View	**3,33**
1 The average employee views the business as a series of linked processes.	4,50
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00
3 The business processes are suffiently defined so that most employees know how they work.	4,50
Process Jobs	**4,00**
4 Jobs are usually multidimensional and not just simple tasks.	4,50
5 Jobs include frequent problem solving.	3,50
6 Employees are constantly learning new things on the job.	4,00
Process Management & Measurement Systems	**1,30**
7 Process performance is measured.	1,50
8 Process measurements are defined.	1,00
9 Resources are allocated based on process.	1,50
10 Specific process performance goals are in place.	1,00
11 Process outcomes are measured.	1,50
Total Score	**2,88**

Returning subcomponents:

≥ Q3: AIs 1 & 3

≤ Q1: AIs 2, 8 & 10

Table 27: Scores BPO subcomponents upper management Vossaert

	Upper Mgmt.	Ranking
1 The average employee views the business as a series of linked processes.	4,50	1
3 The business processes are suffiently defined so that most employees know how they work.	4,50	1
4 Jobs are usually multidimensional and not just simple tasks.	4,50	1
6 Employees are constantly learning new things on the job.	4,00	4
5 Jobs include frequent problem solving.	3,50	5
7 Process performance is measured.	1,50	6
9 Resources are allocated based on process.	1,50	6
11 Process outcomes are measured.	1,50	6
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00	9
8 Process measurements are defined.	1,00	9
10 Specific process performance goals are in place.	1,00	9

Table 28: Scores BPO subcomponents lower management Vossaert

	Lower Mgmt.	Ranking
1 The average employee views the business as a series of linked processes.	4,33	1
5 Jobs include frequent problem solving.	3,67	2
3 The business processes are suffiently defined so that most employees know how they work.	3,67	2
4 Jobs are usually multidimensional and not just simple tasks.	3,33	4
9 Resources are allocated based on process.	3,00	5
7 Process performance is measured.	2,67	6
6 Employees are constantly learning new things on the job.	2,00	7
11 Process outcomes are measured.	2,00	7
8 Process measurements are defined.	1,67	9
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,67	9
10 Specific process performance goals are in place.	1,33	11

Discrepancies:

Table 29: Discrepancies in scores between upper and lower management Vossaert

	Lower Mgmt.		Upper Mgmt.		Diff.
9 Resources are allocated based on process.	3,00	-	1,50	=	1,50
7 Process performance is measured.	2,67	-	1,50	=	1,17
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,67	-	1,00	=	0,67
8 Process measurements are defined.	1,67	-	1,00	=	0,67
3 The business processes are suffiently defined so that most employees know how they work.	3,67	-	4,50	=	-0,83
4 Jobs are usually multidimensional and not just simple tasks.	3,33	-	4,50	=	-1,17
6 Employees are constantly learning new things on the job.	2,00	-	4,00	=	-2,00

Higher scores lower management: AIs 9, 7, 2 & 8

Higher scores upper management: AIs 6, 4 & 3

Vossaert's BPO level is 2,88 out of 5 (Defined), as described in table 26. PJ has a high score, while PM is even lower than was the case for Fero. PV scores moderately. From table 29, one can derive that the lower management is convinced that a lot of PM subcomponents are more developed in the enterprise than the upper management thinks: *Resources are allocated based on process* (AI 9), *Process performance is measured* (AI 7), and *Process measurements are defined* (AI 8). In the other direction, the same is true for two of the three PJ subcomponents: *Jobs are usually multidimensional and not just simple tasks* (AI 4) and *Employees are constantly learning new things on the job* (AI 6). The upper management believes that these two PJ subcomponents are in place in the company more than the lower management.

However, one should be cautious with these discrepancies, because when the scores are transformed into rankings, some subcomponents (including the ones just mentioned) can exhibit more or less the same ranking as one can tell from table 27 and 28. For instance, AIs 1 and 3 are found at the top rankings for both upper and lower management, and AIs 2, 8 and 10 account for the three worst rankings of both groups. This means that the upper and lower management roughly agree on the scores relative to each other (= rankings of the scores and not the absolute scores themselves) for these different subcomponents. It is important to take both approaches (average scores and rankings) into account to analyse the BPO situation in the enterprise.

As was the case for Fero, no AIs are found simultaneously above Q3 for the upper management, and below Q1 for the lower management, and vice versa (table 27 and 28). On the contrary, the quartiles almost entirely overlap as mentioned above.

4.4.2.3 Maes Compressors

General BPO level:

Table 30: General BPO level Maes

BPO Maes	Upper Mgmt.
Process View	3,33
1 The average employee views the business as a series of linked processes.	4,00
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00
3 The business processes are suffiently defined so that most employees know how they work.	5,00
Process Jobs	4,33
4 Jobs are usually multidimensional and not just simple tasks.	5,00
5 Jobs include frequent problem solving.	5,00
6 Employees are constantly learning new things on the job.	3,00
Process Management & Measurement Systems	4,20
7 Process performance is measured.	5,00
8 Process measurements are defined.	5,00
9 Resources are allocated based on process.	5,00
10 Specific process performance goals are in place.	1,00
11 Process outcomes are measured.	5,00
Total Score	3,96

Returning subcomponents:

≥ Q3: AIs 4, 5, 8, 9 & 11

≤ Q1: AIs 2 & 10

Table 31: Scores BPO subcomponents upper management Maes

	Upper Mgmt.	Ranking
3 The business processes are suffiently defined so that most employees know how they work.	5,00	1
4 Jobs are usually multidimensional and not just simple tasks.	5,00	1
5 Jobs include frequent problem solving.	5,00	1
7 Process performance is measured.	5,00	1
8 Process measurements are defined.	5,00	1
9 Resources are allocated based on process.	5,00	1
11 Process outcomes are measured.	5,00	1
1 The average employee views the business as a series of linked processes.	4,00	8
6 Employees are constantly learning new things on the job.	3,00	9
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00	10
10 Specific process performance goals are in place.	1,00	10

Table 32: Scores BPO subcomponents lower management Maes

	Lower Mgmt.	Ranking
4 Jobs are usually multidimensional and not just simple tasks.	4,75	1
5 Jobs include frequent problem solving.	4,50	2
6 Employees are constantly learning new things on the job.	4,00	3
8 Process measurements are defined.	4,00	3
9 Resources are allocated based on process.	4,00	3
11 Process outcomes are measured.	4,00	3
1 The average employee views the business as a series of linked processes.	3,25	7
3 The business processes are suffiently defined so that most employees know how they work.	3,25	7
7 Process performance is measured.	2,50	9
10 Specific process performance goals are in place.	2,50	9
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	2,25	11

Discrepancies:

Table 33: Discrepancies in scores between upper and lower management Maes

	Lower Mgmt.		Upper Mgmt.		Diff.
10 Specific process performance goals are in place.	2,50	-	1,00	=	1,50
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	2,25	-	1,00	=	1,25
6 Employees are constantly learning new things on the job.	4,00	-	3,00	=	1,00
8 Process measurements are defined.	4,00	-	5,00	=	-1,00
9 Resources are allocated based on process.	4,00	-	5,00	=	-1,00
11 Process outcomes are measured.	4,00	-	5,00	=	-1,00
3 The business processes are suffiently defined so that most employees know how they work.	3,25	-	5,00	=	-1,75
7 Process performance is measured.	2,50	-	5,00	=	-2,50

Higher scores lower management: AIs 10, 2 and 6

Higher scores upper management: AIs 7, 3, 11, 9 and 8

Maes has a relatively high BPO score of 3,69 (Linked), as depicted in table 30. It is remarkable that - apart from the PJ component - the PM component scores high as well. Once again, PV scores moderately. However, when comparing the upper management with the lower management, some remarkable findings emerge (table 33). Of all the subcomponents, the scores of the lower management differ the most for the ones belonging to the main PM component. Generally, the upper management is more optimistic about the PM subcomponents relative to the lower management, except for AI 10, in which the reverse relation holds.

However, when considering the rankings of the subcomponents (table 31 and 32), the PM AIs *Process measurements are defined* (AI 8), *Resources are allocated based on processes* (AI 9) and *Process outcomes are measured* (AI 11) have the approximately the same top ranking for both the upper and lower management, while both groups agree on ranking *Specific process performance goals are in place* (AI 10) as one of the least developed subcomponents. Lower management ranks it second to last, while upper management reasons this is the least developed one of all the subcomponents.

Nevertheless, the last PM subcomponent *Process performance is measured* (AI 7) appears simultaneously among the top scoring scores (i.e. AIs ≥ Q3) of the upper and the lowest scoring scores (i.e. AIs ≤ Quartile 1) of the lower management. This results in a precarious discrepancy of 2,50, as can be depicted from table 33.

4.4.2.4 Comparison

To compare the results across the three enterprises, a general ranking is made based on the average scores of the BPO components for the upper management. A distinction is made between the main components (PJ, PV and PM) and the subcomponents.

At the **main component level** (table 34), the average BPO maturity based on upper management for the three SMEs combined is the highest for PJ, and the lowest for PM. Fero and Vossaert exhibit the same ranking for the main BPO components: PJ ≥ PV ≥ PM. For Maes however, PM is assessed higher than PV. Fero has the lowest BPO level with an average of 2,82 (Defined), Vossaert's BPO is slightly better with a score of 2,88 (Defined), and Maes has the highest BPO level with a score of 3,96 (Linked) out of 5. When the BPO level assessed by the upper management is compared with the one of the lower management, Fero's lower management clearly provides a higher BPO score (3,48 vs. 2,82). For Vossaert, the lower management has approximately the same score as the upper management (2,79 vs. 2,88), while Maes' lower management is convinced that the BPO level is less than the one postulated by the upper management (3,58 vs. 3,96). The average BPO maturity according to the lower management for the three SMEs combined exhibits the same pattern as the upper management: PJ ≥ PV ≥ PM.

Table 34: Comparison BPO main components across the three SMEs

BPO Components	Upper management					Lower Management				
	Fero	Vossaert	Maes	Avg. Score	Rank	Fero	Vossaert	Maes	Avg. Score	Rank
PJ	3,33	4,00	4,33	3,89	1	4,00	3,00	4,42	3,81	1
PV	3,33	3,33	3,33	3,33	2	3,60	3,22	2,92	3,25	2
PM	1,80	1,30	4,20	2,43	3	2,84	2,13	3,40	2,79	3
BPO Score	**2,82**	**2,88**	**3,96**			**3,48**	**2,79**	**3,58**		

At the **subcomponent level** (table 35), the top scoring subcomponents (i.e. AIs ≥ Q3) are: *The average employee views the business as a series of linked processes* (AI 1), *The business processes are sufficiently defined so that most employees know how they work* (AI 3), and *Jobs are usually multidimensional and not just simple tasks* (AI 4). These three AIs have an average score of 4,5 out of 5 across the three SMEs. The three AIs with the lowest scores across the SMEs (i.e. AIs ≤ Quartile 1) are: *Process outcomes are measured* (AI 11), *Process terms such as input, output, process and process owners are used in conversation in the organisation* (AI 2), and *Specific process performance goals are in place* (AI 10). One can tell that the PJ subcomponents score the highest, while the PM subcomponents have a low average score. Two of the three PV subcomponents have the highest scores of all the subcomponents, but the PV average decreases a lot, because PV also delivers the second to last subcomponent in terms of average score over the three SMEs: *Process terms such as input, output, process and process owner are used in conversation in the organisation* (AI 2).

Table 35: Comparison BPO subcomponents across the three SMEs

BPO Subcomponents	Fero	Vossaert	Maes	Avg. Score	Rank
1 The average employee views the business as a series of linked processes.	5,00	4,50	4,00	4,50	1
3 The business processes are suffiently defined so that most employees know how they work.	4,00	4,50	5,00	4,50	1
4 Jobs are usually multidimensional and not just simple tasks.	4,00	4,50	5,00	4,50	1
5 Jobs include frequent problem solving.	4,00	3,50	5,00	4,17	4
9 Resources are allocated based on process.	3,00	1,50	5,00	3,17	5
6 Employees are constantly learning new things on the job.	2,00	4,00	3,00	3,00	6
7 Process performance is measured.	2,00	1,50	5,00	2,83	7
8 Process measurements are defined.	2,00	1,00	5,00	2,67	8
11 Process outcomes are measured.	1,00	1,50	5,00	2,50	9
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00	1,00	1,00	1,00	10
10 Specific process performance goals are in place.	1,00	1,00	1,00	1,00	10

The rankings of the AIs for the individual companies do not deviate much from the general average ranking, as can be visually derived from table 35. Green cells indicate AIs ≥ Q3 both for the individual enterprises and the average score across the three SMEs, while red cells indicate AIs ≤ Q1. Green cells are grouped together towards the top, while the red cells are found at the bottom.

4.5 **Step 5**: Identification of action areas

Once the maturity of a firm is determined, one can use the immaturity of certain categories in the maturity model to identify action areas which require attention. In this way, enterprises can act to improve the management of their business processes. To identify those immature categories, the **qualitative assessment** of the extensive HAM-PEMM is used. The MCC-BPO model gives additional insights when findings of the two models overlap to confirm (and strengthen) the findings. The completed models for each respondent are attached in Appendix (Exhibit 3 and 4).

Before identifying the action areas, it is important to fully comprehend the stepwise structure of Hammer's PEMM to become more mature. The PEMM implies that there is a path to becoming a process enterprise (Hammer, 2007). Before being able to improve the maturity level of the processes, organisations need to offer supportive environments. This means that the **enterprise capabilities** need to advance to a certain maturity stage before **process enablers** can progress to the same stage. For instance, when a company reaches the E-1 level for all its enterprise capabilities, it is ready to advance all its process enablers to the P-1 level (Hammer, 2007). As indicated in the description of the PEMM (section 4.2.2.1), a maturity level is considered as reached when the answer is somewhat true (yellow) or largely true (green). The sawtooth path to reach business process excellence is displayed in figure 5.

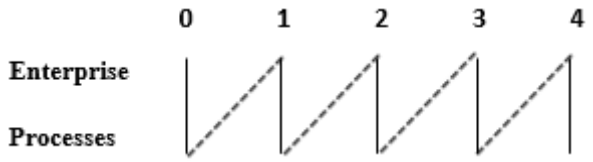


Figure 5: Sawtooth pattern

This step is again structured case-by-case, and breaks down as follows: First (sub)categories belonging to the PEMM are identified which are hindering the **transition to a higher maturity level** for each SME separately. For the same reason as the intercompany analysis in *Step 4: Application of the Maturity Models*, the data of the upper management is used. Based on these categories and the stepwise path, the researchers identify action areas which should be focused on to reach a feasible level of process (and enterprise) maturity in the short to medium term, and which should be addressed first to reach business process excellence in the long term. The action areas selected out of the different categories and subcategories provided by the PEMM are again represented in the following manner: Category-Subcategory. Second, the most notable **discrepancies** in the scores between upper and lower management are discussed as defined in section 4.4 (*Step 4: Application of the Maturity Models*).

To support the identification of action areas, the decision was made to identify the Order Fulfilment Process within the company together with the upper management during an interview. For each SME,

the Enterprise Architecture (EA) modelling tool ArchiMate was used to map the order fulfilment process in an efficient and easily interpretable manner. The visually attractive and comprehensive layout makes it an ideal tool for representing the companies' business process(es). Linking together the business layer, application layer and technology layer delivers valuable insights in the IT support of the process and the different actors responsible for certain tasks. The Enterprise Architecture models for the three case studies are included in Appendix (Exhibit 5).

4.5.1 Fero

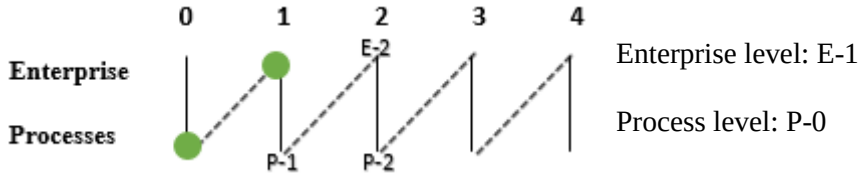


Figure 6: Maturity level Fero based on PEMM

4.5.1.1 Improve Maturity level

Enterprise Architecture model: Appendix (Exhibit 5.1).

P-0 to P-1

As the enterprise capabilities for Fero are all at E-1 or higher, they are ready to advance all their process enablers to P-1. In this case, there are two action areas that need attention. First, there is Design-Documentation. As there is nothing documented related to processes yet, it is difficult to redesign them in an efficient and value-adding manner. The MCC-BPO component PV scores moderately as well. During the interview, the general manager of Fero mentioned that there have been plans to draw up a so-called 'Bible' in which all processes and functions would be described extensively. Yet, as of now, this has not been realised. In order to reach P-1 in this subcategory, the processes should be described in a functional manner. Based on the first interview, the researchers drafted an EA model which might serve as a first step in documenting the processes. A second action area is Owner-Activities. This subcategory states that the processes should be identified, documented and communicated towards all employees to reach the P-1 level. As there was no documentation at the moment of the interview, this criterion has not been fulfilled. However, *The average employee views the business as a series of linked processes* (AI 1) and *The business processes are sufficiently defined so that most employees know how they work* (AI 3) have a high MCC-BPO score of 4 out of 5 or higher. This may indicate that the upper management is convinced that processes are sufficiently identified and communicated towards the employees, and thereby passing over the documentation phase. Since McCormack and Johnson (2001) state that documentation is the foundation on which future improvements can be built, the researchers recommend that Fero should start to document its most important processes. Although the current state

of affairs may be good enough to make sure all the employees understand the processes, have a clear view on them and know what they have to do, the researchers believe that to identify or implement improvement initiatives, the processes should first be documented As-Is.

E-1 to E-2

Before the process level can become higher than P-1, the enterprise level should be at least E-2, providing a supportive environment for the process development. At Fero, there are two subcategories that have to be addressed to reach this E-2 level. Culture-Teamwork is at the E-1 level as working in teams is encouraged during projects and occasional. To reach E-2, the company should make use of cross-functional project teams for improvement efforts. As can be derived from the EA model, there are multiple people responsible for different stages in the process. Connecting these people in cross-functional teams could lead to a better alignment between the stages and consequently shorter lead times for customers. Next to this, Governance-Process model must be addressed as well. Even though the company has identified certain business processes, these have never been fitted in a process model. The EA model created in ArchiMate by the researchers using the input from the first interview can serve as this process model.

P-1 to P-2

After addressing all previously mentioned action areas, the company can move their process level to P-2. The subcategories that need attention here are the ones described above in the section 'P-0 to P-1' together with three more subcategories that are already at the P-1 level. First, there is Design-Documentation again, which requires an end-to-end documentation of the business processes. Next, there is Owner-Activities as well as Owner-Identity. The former stipulates that the process owner should articulate the process's performance goals and develop a vision for the future, something which is absolutely lacking according to the MCC-BPO model as well, with a score of only 1 out of 5 for the subcomponent *Specific process performance goals are in place* (AI 10). The latter demands that the management should install an official role for the process owner overseeing the entire process. In the EA model, this would be someone who is assigned to the complete order fulfilment process and takes responsibility for the performance. Finally, there is a need for Metrics-Definition and Uses, supported by a MCC-BPO score of 1,8 out of 5 for PM. The Definition part requires that there are end-to-end process metrics in place in the form of KPIs. For Fero, there are only a few KPIs defined (e.g. the number of pickings per employee). These KPIs are only relevant for the Reception & Storage part (EA model), while for the other subprocesses, nothing is measured. The subcategory Uses questions whether these metrics are used to compare performance with benchmarks.

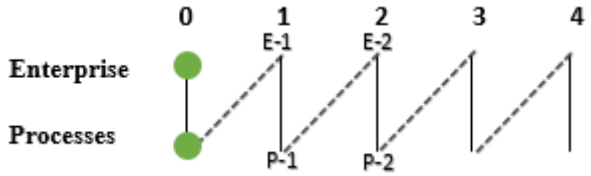
To conclude the general part, it can be seen that the further Fero desires to move along the path towards a higher enterprise and process level, the more (sub)categories have to be addressed. While moving from

P-0 to P-1 and from E-1 to E-2 seems to be feasible on the short term, the evolution from P-1 to P-2 requires substantially more work and is probably not something that can be achieved on a short notice. For each step that is taken towards a higher maturity level, each company needs to decide for itself whether it is still worthwhile.

4.5.1.2 Discrepancies upper and lower management

At Fero, there are three subcategories which show a large score difference between upper and lower management, as described in section 4.4.1.1. There are two subcategories which were attributed significantly higher scores by the lower management**.** The first subcategory Culture-Teamwork is believed to be at E-4 by the lower management, meaning that teamwork with customers and suppliers is commonplace. The upper management indicates it is only at E-1, which means teamwork is project focused and occasional. A reason for this can be the fact that both parties view the company from a different perspective. The upper management might not realise the cooperation between employees, while the lower management is more present on the work floor to see these interactions. Communicating clearly towards each other seems to be an appropriate solution for this area. Second, the lower management on average filled out the subcategory Owner-Activities as P-3, indicating that process owners work together to achieve company goals. As mentioned in the previous section, the upper management believes this subcategory is merely at P-0, given the fact that there is no documentation about the process. During the interview, they also stated that there are no real company goals nor an unambiguous vision for the future of the company processes. After reviewing the answers of the lower management, it seems that they coloured most of the cells in yellow, indicating they probably did not entirely understood the criteria. To conclude, there is one subcategory which is perceived to be better by the upper management, namely Leadership-Style. The leadership of the company states that the company is led more through vision and influence rather than command and control, being the E-4 level. Lower management on average thinks it is only at the E-1 level, indicating there is an ongoing shift from a top-down, hierarchical style to an open, collaborative style. The reason for this can be the fact that lower management does not really know what the company leadership thinks or does. For instance, the E-2 level gauges whether the upper management is passionate about the need to change and the key role for processes in this. The fact that the leadership indicates this to be true, while the lower management does not, gives away that their devotion to the need to change is not really reflected in their actions.

4.5.2 Vossaert Kitchens-Interior



Enterprise level: E-0

Process level: P-0

Figure 7: Maturity level Vossaert based on PEMM

4.5.2.1 Improve Maturity level

Enterprise Architecture model: Appendix (Exhibit 5.2).

E-0 to E-1

At the enterprise level, Vossaert is only at the E-0 level. The only enterprise capability which is hindering the rise to the E-1 level is Leadership-Alignment. The leadership has no belief that a proper process program is in place, in which scenarios are described to handle certain situations. If something irregular happens, there are no standards to fall back on. Hence, every situation is handled ad hoc, something which can be resolved by developing company-wide standards in consensus with the different departments.

P-0 to P-1

If the company would be able to reach the E-1 level, the road to advance from P-0 to P-1 is open. However, some process subcategories must be addressed first. For a start, Metrics-Definition is absolutely lacking, which is supported with a score of only 1,30 out of 5 for the PM component of McCormack's BPO. The general managers mentioned that for the six subprocesses of the order fulfilment process (displayed by the EA model), standardised company-wide KPIs are almost non-existing. It is self-evident that if metrics are not defined, Metrics-Uses do not exist either. The metrics must be defined first in order to use them to measure performance and to detect causes of underperformance. Another enabler which needs attention is Design-Documentation. The MCC-BPO component PV scores moderately as well. Business processes need to be documented to propose improvements (McCormack & Johnson, 2001). In the case of Vossaert, nothing is documented. A first step to address this is to map the most important processes, like the order fulfilment process (EA model with ArchiMate).

E-1 to E-2

To achieve the E-2 level, six subcategories need to be upgraded. To start, Culture-Teamwork should be enhanced. Vossaert is characterised by a flat organisational chart. Below the two managers, there are 54

employees, with no specific functions in between. Coordination wise, this structure is difficult to preserve. A possible remedy could be to develop some functions in between, with authority and control over a part of the business. This would not only enhance coordination, but also take the burden off the shoulders of the two managers, who have authority and control over numerous processes. Furthermore, those would be the people who could form the cross-functional teams which are required to reach the P-2 level. Additionally, Culture-Customer focus should be handled by creating a belief among the employees that the purpose of their job is to create value for the customer. Since there is already a common belief within the enterprise that customer focus is crucial (E-1 level), changing the mindset to the E-2 level should not be much of an additional effort. Involving the employees in the financial situation of the company could be a first step in making them clear how their individual jobs contribute in delivering value for the customer. Third, there is Expertise-People**.** No one in the company is experienced in the design and implementation of processes, nor change management. Vossaert can resolve this by hiring an expert, but a better idea might be to empower a current employee - who knows the company well - by letting him/her take process modelling and change management classes. This could be integrated as part of a promotion package. To continue, the subcategories Leadership-Alignment and Leadership-Behaviour need to be elevated. The former is addressed by elaborating on the action area suggested to go from E-0 to E-1 (cf. supra). The latter is more complicated. Due to the enormous workload and multidimensionality of jobs (which is supported by a McCormack BPO score of 4,5 out of 5) of the two general managers, they honestly admit that setting out ambitious goals has become a side issue. As mentioned before, the general managers could shift a part of the workload to other employees, so they can focus more on the strategic direction of the company, which is necessary to obtain the E-2 level. Finally, the last subcategory which requires focus is Governance-Process model. Vossaert already identified some business processes, but the documentation which is required for level E-2 is lacking. Again, the EA of the order fulfilment process could be a first step in the right direction.

P-1 to P-2

If the enterprise would be able to reach the E-2 level by focusing on the aforementioned six enterprise subcategories, the enterprise could advance on the sawtooth path to the P-2 level. To take this step, four process enablers should be improved as well. Three of these enablers are the ones which needed to be addressed to move from P-0 to P-1; Metrics-Definition, Metrics-Uses, and Design-Documentation. Cost and quality metrics should not only be defined for the subprocesses of a process, but should be end-to-end, centred around customer requirements. For instance, to predict accurate lead times to the end customers, Vossaert should be able to predict the lead times of all its individual subprocesses (Design + quotation, Setup file, Purchasing materials, etc.) as can be derived from the EA model. Subsequently, those metrics should be compared to benchmarks to set performance targets. Finally, the documentation should not only be functional, but also comprehensive and end-to-end to move from P-1 to P-2. The fourth enabler entails Owner-Activities. The representatives of the different (sub)processes, e.g. the

purchase responsible for the purchasing materials subprocess or the installer for the installation subprocess (cf. EA-model) should develop process performance goals and a vision on future improvements. MCC-BPO states that specific process performance goals are absolutely lacking, with a score of 1 out of 5. Considering these four subcategories, the enterprise could move along the pathway to the P-2 level.

In conclusion, Vossaert has a long journey ahead if they would want to improve the maturity of both their enterprise and processes. Moving to the E-1 and P-1 level seems feasible on the short term, but advancing to the E-2 level, and subsequently to the P-2 level requires a lot of effort, not only in terms of improvement initiatives, but also by drastically changing the mindsets of the employees and the leadership.

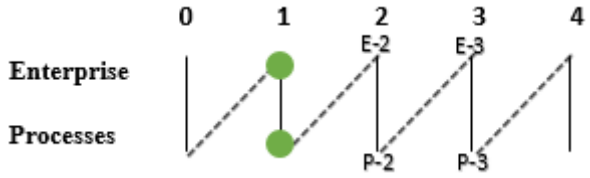
4.5.2.2 Discrepancies upper and lower management

In section 4.4.1.2., the largest discrepancies between upper and lower management were distinguished. Five subcategories attract the attention. Three of them were attributed significantly higher scores by the lower management. The largest discrepancy comes down to the subcategory Culture-Customer focus. It is ranked on the E-3 level by the lower management, compared to the E-1 level indicated by their superiors. Employees believe that they do not only realise their job is to create value for the customers, but they also understand that customers demand constant quality and an immaculate experience. Upper management thinks that their employees do not entirely adhere to this mentality. They partially admit that there is a common belief among the employees that customer focus is crucial, but not more than that. Because this enterprise capability measures the performance of the mentality of employees, the researchers are inclined to give more value to the answers of the upper management, who are in a better position to assess the performance of their employees than the employees themselves. Making the employees aware of this lacking mindset could increase the customer focus in an accurate manner (cf. supra). Two more moderate discrepancies assessed higher by the lower management include Design-Documentation and Owner-Activities. They are already described extensively in the 'Improve Maturity level' part for the upper management, who ranks these subcategories at the E-0 level, implying they are not in place. The lower management however, ranks both enablers at the E-2 level or higher. This seems extremely odd, since the former is an objective question (documentation is in place or it is not). The latter is more open for debate, but it also raises eyebrows. An explanation could be that some departments have documented some of their processes, but have not communicated it to their supervisors or other departments.

Vice versa, the subcategories attributed higher scores by the upper management are Leadership-Style and Owner-Authority. It should be said that these discrepancies are more moderate than the ones in the

other direction. For the former, the upper management thinks the E-2 level is attained, while lower management believes only E-1 is reached. This was the case for Fero as well, but the discrepancy was larger (E-4 vs. E-1). Hence, the same remark can be made in this case; it is possible that the lower management does not really know what the company leadership is doing (cf. supra). For the latter, upper management assigns it to the E-3 level, versus the E-2 level provided by the lower management. The change in perspective can be attributed to the fact that the main authority of the processes lies with the two general managers, and that they have a better understanding and helicopter view about the authority of the processes than the lower management, who are far less involved.

4.5.3 Maes Compressors



Enterprise level: E-1

Process level: P-1

Figure 8: Maturity level Maes based on PEMM

4.5.3.1 Improve Maturity level

Enterprise Architecture model: Appendix (Exhibit 5.3).

E-1 to E-2

Of the three assessed companies, Maes Compressors seems to be the furthest down the path of maturity in the PEMM. On the enterprise level, there is only one subcategory that inhibits the company to reach E-2, namely Culture-Attitude toward change. While the company leadership believes there is a growing acceptance within the company for the need to change, employees are not assumed to be prepared for significant changes in their work. This can also be deduced from McCormack's BPO model, in which the upper management of the company provides a moderate score of 3 out of 5 on the question: *Employees are constantly learning new things on the job* (AI 6). This may indicate that the upper management thinks that employees may not always be willing to learn on their jobs, and stick to the way they have done things in the past. Changing the way they have always done their jobs may be a delicate topic. This issue is all about the mindset of the employees. They need to be convinced that changes are not necessarily a bad thing. The researchers believe that this can be resolved by the upper management through being more transparent towards the employees about the company strategy, vision and mission. When employees know the direction a company wants to go, they will probably be able to comprehend necessary changes within their functions.

P-1 to P-2

When having addressed the enterprise component, making sure it is at E-2, the company can focus on the processes. In order to move from P-1 to P-2, there is again only one subcategory that needs attention, namely Metrics-Definition. At Maes, there are already a few KPIs in place to measure performance, supported by a high BPO PM score. However, these are not end-to-end process metrics. They are solely focused on the technicians who go to clients for installations, maintenance or reparations (EA model). Two important KPIs are in use. A first one is efficiency, which is the ratio of the time a technician actively works on a machine and the time he spends with the client. The second one is dispatching, which is the ratio of the time a technician spends with the client and the total time needed for the job (traveling time and working time). As their ERP software package is encompassing the whole process, it seems feasible to implement some end-to-end KPIs. Some possible metrics are: Order lead time and percentage of parts backordered. In addition, McCormack's BPO reveals that process measurements are in place, but specific process performance goals are absolutely lacking (BPO score of 1 out of 5). Without performance targets, KPIs lose a significant part of their value.

E-2 to E-3

Surprisingly, to move from E-2 to E-3, Culture-Attitude toward change is again the only factor that needs to be addressed. The E-3 level specifies that employees should be prepared for major, multidimensional changes. The advice here is analogous to the one given in the first instance, namely providing more transparency and engaging employees.

P-2 to P-3

To move from P-2 to P-3, Maes should address a few more subcategories. A first one is again Metrics-Definition. In addition to implementing the end-to-end KPIs, the company needs to make sure these are in line with the strategic goals. As these metrics still have to be implemented, it only makes sense that they should fit the organisation's strategy at once. Defining metrics for the sake of it is not likely to add much value. Second, there are two subcategories for the process enabler Performers that are currently at the P-2 level. First, Performers-Knowledge stipulates that employees should be familiar with fundamental business concepts and able to describe how their work influences the company performance. This is in line with the moderate BPO score for the PV component. The solution here seems to be rather straightforward. The upper management should engage the employees and spark their interest in the entire company, not just their own jobs. Making the KPIs visible for every employee is something that is easy to implement and could give a comprehensive overview of the company performance. If employees can see how their efficiency impacts the company, they might feel more engaged. Second, Performers-Skills questions whether the employees are skilled in business decision making. During the interview, it was clear that the leadership was very reluctant towards this concept. The opinion of the upper management is that business decisions ought not to be made by employees.

Possibly, the flat structure of an SME has something to do with this. In large enterprises, business decisions can be made to a certain extent by a multitude of employees within their function domains. In an SME however, there are not many layers within the company, which means business decision making always passes through the leadership. Finally, there is the subcategory Owner-Identity. The processes within Maes have been documented and are reflected upon regularly. The P-3 level requires that for the process owner, the process comes first in terms of time allocation and workload. As is the case in most SMEs, job descriptions are rather broad. Process management is being handled by a handful of people, but due to the limited number of employees, it is not possible to have someone who is a full-time process owner.

As can be seen from this last part, evolving towards the P-3 level seems to be rather difficult for Maes. There are certain aspects that are difficult to overcome at the company. Empowering employees to take business decisions and hiring a full-time process owner seem to be sensitive topics which are not easy to overcome. The question is whether this is the optimal level of maturity for Maes or whether they should make an effort to get past these hurdles.

4.5.3.2 Discrepancies upper and lower management

There are three subcategories which show a large score difference between upper and lower management. This is described in section 4.4.1.3. Two of them are subcategories which were attributed higher scores by the lower management, namely Performers-Knowledge and Culture-Attitude toward change. It is interesting that both subcategories are constructs that need to be addressed based on the data of the upper management to reach a higher maturity level. First, while the leadership believes that the subcategory knowledge is at the P-2 level, the lower management on average thinks it is at P-3 already. The performers are thus convinced that they know the impact of their work on the company performance. Nonetheless, it is certainly not a bad thing to further engage the employees in order to broaden this knowledge. Second, the lower management indicates that employees are prepared for significant changes in their jobs, while the upper management does not believe so. It will be through transparency and clear communication that the perception about this can be aligned throughout the whole company. An interesting discrepancy where upper management is at the P-3 level and lower management merely at P-1 is Design-Documentation. During the interview, the general manager showed and shared the process documentation. It was clear that the process was at least documented from end-to-end, which is not reflected in the data from the lower management. This discrepancy indicates that the process documentation is not well distributed throughout the company, which is a pity. Going through the trouble of documenting certain aspects of the company and not sharing it with the employees is not value-adding at all.

5 Discussion

As the case study steps have been developed and adjusted along the way, without a validated predecessor, they are prone to certain imperfections. This section serves as a reflection on the execution of the case study steps. Step-by-step, the researchers defend choices made along the way, indicate what could have been done differently and subject the used models/techniques/methods to a critical evaluation.

5.1 SME selection

Although perceived rather straightforward, the selection procedure of the SMEs has played a crucial role. It served as the basis of a valid case study research. The leadership of the SMEs participated actively during the interviews, its lower management took the time to complete the surveys and the researchers could always reach them for additional questions and clarifications. In conclusion, the selection procedure proved to be useful, since it delivered three SMEs suited for the study.

5.2 BPMM selection and evaluation

In retrospect, some remarks can be made concerning the selection of the maturity models. For a start, the researchers classified the criterion **Capabilities** of the BPMM Smart-Selector as a soft constraint, with the answer to the criterion preferably being 'Basic + Culture + Structure'. In this way, models were selected in which this constraint is violated as well. As one can tell from table 4 in section 4.2.1 (*Step 2: Selection of Business Process Maturity Models),* HAM-PEMM contains all these capabilities, FIS-BPMM only Basic + Culture, and MCC-BPO merely comprises Basic capabilities.

The BPO model may be a good choice for SMEs who want to assess their Basic capabilities, and want to use this maturity level as a benchmark. The questionnaire is a lot smaller in size than PEMM, the model structure is not difficult to comprehend, and the questions are understandable for both the upper and lower management of the SMEs. However, identifying action areas that need attention, and consequently proposing improvement efforts which could possibly remedy these so-called 'gaps' in an organisation's maturity level proved to be difficult. This may be (partly) attributed to the fact that BPO only assesses 'Basic' capabilities. This in contrast to PEMM, which extensively assesses all the capabilities, and which provides information about how to take the gaps to a higher maturity level. Hence, recommendations to the firms are based upon PEMM, and BPO is used as a supportive model to give additional insights (cf. *Step 5: Identification of action areas*). Perhaps, by making this constraint hard and requiring the models to capture all capabilities (Basic + Culture + Structure), the BPMM Smart-

Selector might have recommended a second model besides PEMM which could fulfil a more complementary rather than a supportive one.

A second remark can be made regarding **FIS-BPMM** in general. As described in *Step 3: Fine-tuning of the Maturity Models*, the conclusion was reached that PEMM roughly comprises FIS and therefore the model was discarded. Nonetheless, the researchers made the exercise of using the data of PEMM to fill out the FIS model. For each lever, the three SMEs were mainly found at the first maturity stage: Siloed, and for some levers, the second stage Tactically Integrated could be reached. Comparing the three SMEs, almost no differences in maturity per lever were found. This is remarkable, since the SMEs displayed obvious differences in maturity according to the other two models. In addition, identifying ways to remedy the inhibiting elements proved to be difficult, and the ones who could be deduced entirely overlapped with the ones identified by PEMM. These findings strengthen the belief that the added value of FIS relative to the time it takes to assess the maturity is limited. Given the fact that a lot of the criteria of the Smart-Selector were fixed to a certain answer (hard constraints), it is not remarkable that models with overlapping constructs were recommended by the tool. Besides, it should be stated that PEMM comprises only 'roughly' FIS. One of the model's levers of change could hardly be assessed by the categories belonging to PEMM: 'Strategy'. Given the fact that BPO does not really take strategic alignment into account either, the researchers lack the tools to assess one of the core elements of BPM (section 3.1.1: *BPM decomposition*).

The question however remains whether the researchers should have used the Fisher's BPMM or not. By using Hammer's PEMM with McCormack's BPO model in a supportive role, the researchers were able to formulate an answer to the research question (cf. infra). Only concerning the core element strategic alignment, the researchers were hardly able to identify gaps and/or propose improvement initiatives. However, it is doubtful that Fisher's BPMM would be able to do this given the fact that identifying ways to remedy the different levers of change proved to be difficult.

5.3 BPMM fine-tuning

For **HAM-PEMM**, the most extensive model of the three with 26 assessment items, there are certainly opportunities to make it more suited to the needs and structure of an SME. This resulted in two fine-tuning steps. For both of them, a remark can be made.

First fine-tuning step

In the first fine-tuning step, 4 of 26 subcategories were left out based on the feedback from the selected SMEs, because those subcategories were deemed as irrelevant to examine within an SME context. Upon

reflection, one of these subcategories proved to be relevant after all, namely **Expertise-Methodology**. During the first interview, the three SMEs agreed on the fact that methodologies for making (incremental) process improvements were not present at the moment and believed that personal experience is sufficient to resolve issues and make improvements. This is proven by the low score of Expertise-People and Metrics-Definition and Uses. As there are no people within the SMEs that are formally burdened with process management tasks, metrics tend to be underdeveloped. Consequently, a structured methodology is absent as well. Reviewing this subcategory after the analysis exposed a certain coherence between these different assessment elements. Improving on these elements might create a supportive environment for the development of a set of methodologies to redesign and improve business processes.

Further, there were two subcategories omitted from the main category Governance. For **Governance-Accountability**, the researchers still believe it can be neglected. The end-responsibility always comes down to the leadership in an SME. There might be certain functions that have a certain amount of accountability, yet this is always shared with the upper management. **Governance-Integration**, stating there should be (in)formal coordination bodies for process redesign projects is still believed to be irrelevant for SMEs as well. Given that the third subcategory Governance-Process model is one of the lowest scoring subcategories raises the question whether the enterprise capability of Governance delivers any significant contribution to business maturity at all. The fact that the structure of an SME is completely different compared to a large enterprise, governance practices might differ as well. In an SME, this task is mostly centralised with the upper management, while in a large enterprise, there is more room for decentralisation and the development of specific functions or coordinating bodies.

A final subcategory that was left out is **Infrastructure-Human resource systems**. The fact that SMEs have fewer complex processes than their larger counterparts, makes the alignment between the HR policy and the process's design less desirable. Job descriptions are often multidimensional, which makes it difficult to base them upon the process's design. The researchers suggest that this subcategory can be omitted as it does not bring much to the table in improving the business performance.

In conclusion of this first fine-tuning step, there seems to be a place for Expertise-Methodology after all in SMEs, while the subcategory Governance-Process model could possibly be omitted. This results in the omission of the entire category of Governance, composed of three subcategories and the subcategory **Infrastructure-Human resource systems**, because they are not deemed relevant to examine in SMEs. However, this does not mean that there is no need for governance practices or human resource systems in SMEs. The remarks are solely based on the measuring constructs defined in the PEMM.

Second fine-tuning step

For the second fine-tuning step, 6 of 22 remaining subcategories were omitted for the lower management. In the comparison of the data from the upper and lower management, the absence of these six subcategories made it impossible to compose a full ranking consisting of all the data. Determining returning subcategories and identifying discrepancies had to be done with a dataset of 16 subcategories instead of 22. The researchers may have missed out on some interesting insights in this manner. For example, the upper management can state that there are process metrics in place and even prove it, but when this is not backed up by the lower management, it delivers valuable information that these metrics are not communicated properly.

In hindsight, this drawback outweighs the time efficiency and better manageability of the shortened model with 16 assessment items, proving the second fine-tuning step to be redundant after all.

5.4 Data analysis

Analysing the **HAM-PEMM** proved to be rather difficult using the qualitative approach proposed by Hammer (2007). For this reason, a quantitative approach was developed. However, going from qualitative to quantitative data raises an important issue. The model is not designed to be subjected to a quantitative analysis. Consequently, the researchers need to be careful with drawing conclusions from these results. The number key has been used to represent the data in a way that is easily interpretable. Both for the intracompany and intercompany analyses, it became possible to see how the different (sub)categories related to one another. To identify action areas in *Step 5: Identification of action areas*, the PEMM was used in the qualitative manner as proposed by Hammer.

Another concern was the possible bias in the data for the intracompany analysis. As the upper management filled out the models guided by an interview, while the lower management only received the surveys with some general guidelines, there might occur an undesirable pattern.

The results of the **PEMM** revealed the lower management from Fero and Vossaert as more optimistic, while for Maes, it was the upper management that provided higher scores. At first sight, it would seem as if there is no real bias in the results. However, looking at the data as it has been filled out with the colours in the PEMM reveals an interesting phenomenon. The upper and lower management both filled out 16 subcategories, each consisting of 4 statements. Of these 64 statements, the lower management on average attributed a yellow colour to almost half of them, while the upper management at most to a quarter of the statements. Upon reflection, it can be stated that filling out the survey without any guidance proved to be rather difficult for the lower management. Rather than answering ‘completely

agree' or 'completely disagree', they often prefer to go for the safe option of 'partly agree'. This might be caused by a lack of understandability of the different concepts, despite the effort of the researchers to simplify certain terminology. This issue could be resolved by guiding every survey by an interview, but that might not always be feasible.

For the **BPO** model, the lower management on average attributed a higher score at Fero, a lower score at Maes and approximately the same score at Vossaert. Therefore, it seems that no biases skewed to a particular side can be attributed to the fact that the maturity is assessed in a different way for the upper and lower management. However, a particularity came to light when comparing the scores of both groups per SME in section 4.4.2. For all considered SMEs, the *absolute scores* of the upper and lower management differ, but the *relative rankings* of those scores can be very similar. This can be explained by the following: in all three SMEs, upper management tends to give higher scores for top rankings (i.e. AIs $\geq$ Q3), and lower scores for bottom rankings (i.e. AIs $\leq$ Q1). Hence, upper management provides more extreme scores, in both directions, while lower management provides more moderate scores. This is probably because for the upper management, scores of only one (Maes) or two general managers (Fero and Vossaert) are averaged, while more scores are averaged over the members of the lower management (the lower management consists of five respondents for Fero, three for Vossaert and four for Maes). If a member of the lower management with only domain knowledge over his/her business domain takes on the maturity questionnaire, it is expected that he/she will assign a moderate score to an assessment item of which he/she has no relevant knowledge. Upper management has less problems with this, since it has a better total view on the business. On the other hand, chances are higher that the scores will differ over assessment items seen from different perspectives (e.g. warehouse manager perspective vs. head of accountancy perspective). Averaging these scores results in more moderate scores for the lower management as well.

5.5 Action areas

Regarding the identification of action areas, a first remark concerns the **criterion used to reach a particular maturity level** in HAM-PEMM. Hammer himself leaves room for interpretation. He states that companies find it effective to treat the statements not as true or false, but largely true, somewhat true, or largely untrue (Hammer, 2007). This way, companies can decide for themselves whether they use the somewhat true (yellow) or largely true (green) criterion to determine which maturity level they are at. The researchers decided to use the somewhat true (yellow) criterion. This is done to focus the attention on the red cells, i.e. roadblocks that keep the process or enterprise from achieving a higher level of performance (Hammer, 2007). According to the researchers, these roadblocks form the largest inhibiting elements in the further implementation of BPM, and therefore represent the most urgent action

areas. A significant drawback from this decision however, is the fact that if two or more yellow cells follow each other, a subcategory that needs attention might stay under the radar. This can create the impression that a subcategory is more developed than it actually is.

Another comment can be made regarding the **order fulfilment process**. The researchers classified both 'type of business processes' and 'nr. of business processes' as hard constraints in *Step 2: Selection of BPMMs*. The former was set to generic, the latter to all business processes, meaning the assessment should be general and conceptual. Nevertheless, the researchers modelled a single business process as an EA to support the identification of action areas. The reasoning behind this decision can be explained as follows. First, the researchers established that the order fulfilment process is one of the most important processes occurring in an SME, if not the most important one. A lot of (sub)processes are attached to it, or originate from it. Therefore, improvement efforts made for the order fulfilment process will most likely benefit those (sub)processes as well, and some recommendations apply for both the main process and the attached (sub)processes. Second, apart from assessing the generic maturity of the enterprise, improvement initiatives could be more easily distracted if the researchers had knowledge of, and insight in a tangible business process. To get a total picture of the way business is conducted in a short period of time, identifying the order fulfilment process has proven to be an efficient solution.

A final remark concerns the **relevant maturity stage** to target for each SME. During the identification of action areas, the researchers only recommended improvement initiatives to elevate the maturity in the short to medium term (i.e. improving 1 to 2 maturity stages). The researchers followed the reasoning of de Bruin & Rosemann (2005), who mention that the highest maturity stage is not necessarily the optimal one for an enterprise (cf. supra: *section 1: Introduction*).

6 Conclusion

What is the current state of Business Process Management (BPM) in Belgian SMEs, which elements are inhibiting its further implementation, and how can these be remedied to advance the BPM of the organisation?

Part 1: *What is the current state of Business Process Management (BPM) in Belgian SMEs?*

Considering **MCC-BPO**, Maes exhibits the highest level of maturity, with a BPO score of 3,96 out of 5 (figure 9). This represents the Linked level, the so-called breakthrough level according to McCormack and Johnson (2001). Fero and Vossaert operate at a lower level of maturity: the Defined level, with a respective BPO score of 2,82 and 2,88 out of 5.

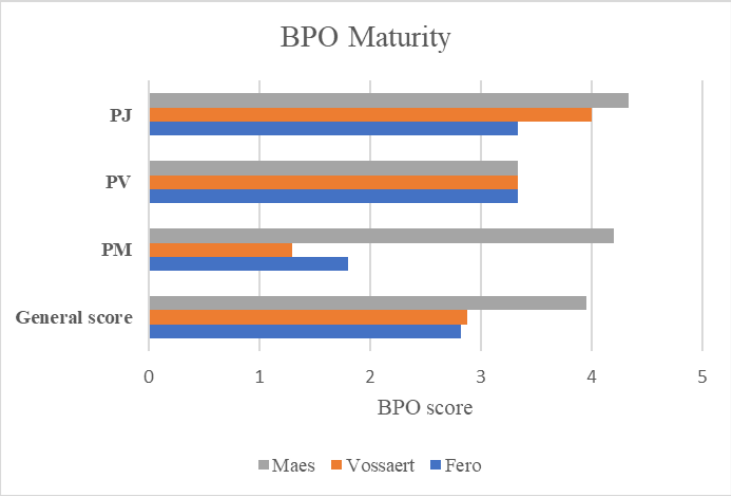


Figure 9: BPO Maturity level

According to a qualitative analysis of **HAM-PEMM**, Maes seems to be the furthest down the path of maturity as well (figure 10). They operate at the E-1 level for their enterprise capabilities, and P-1 level for their process enablers. Fero is the second of the class, having reached the enterprise E-1 level. However, their processes do not reach the first level. They are found at the P-0 level, meaning that process maturity is absolutely lacking. Vossaert has the lowest maturity level; both the enterprise and the processes are found at the lowest level; E-0 and P-0.

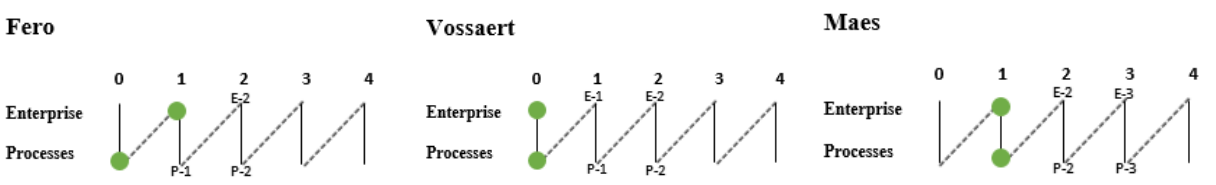


Figure 10: PEMM qualitative maturity level

In conclusion, putting together the two models illustrates the rather low level of maturity in the three examined SMEs. The only reported relatively high level of maturity was the BPO score for Maes, which corresponds to the Linked level. Nevertheless, this is invalidated by PEMM, with enterprise and process levels of respectively E-1 and E-0. Considering this, the researchers can say that the results of Part 1 of the research question correspond to the literature about the adoption of BPM in SMEs. BPM practices in these three Belgian SMEs are indeed relatively low, regardless of its potential impact (Bandara & Opsahl, 2017). In Part 2, the researchers formulate an answer on the question why these practices are low, by identifying which elements are hindering the transition to a higher maturity level.

Part 2: *Which elements are inhibiting the further implementation of BPM?*

A quantitative analysis over the three case studies indicates that the lowest scoring *main categories* in the PEMM on average are Expertise, Governance and Metrics. The averages of the process enablers and enterprise capabilities are presented for the three SMEs in figure 11.

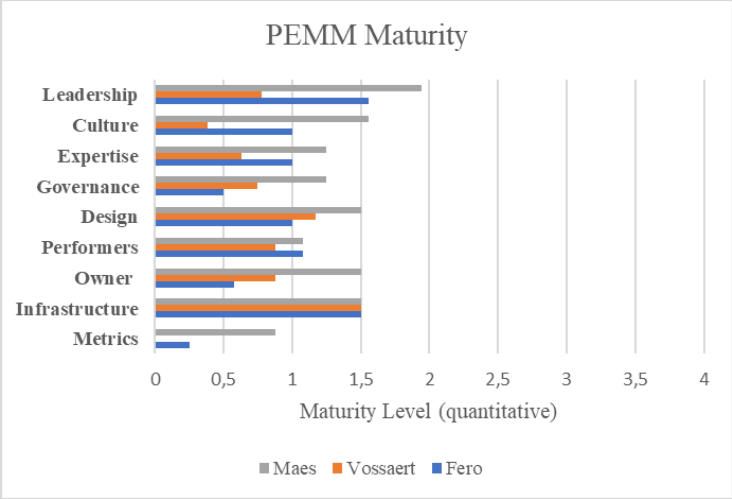


Figure 11: PEMM quantitative maturity level

Regarding the *subcategories*, the lowest scoring constructs are **Performers-Skills**, **Metrics-Definition**, **Metrics-Uses, Culture-Attitude toward change**, **Design-Documentation** and **Governance-Process model**. In general, keeping the limited scope of this study into account, the following conclusion can be made. While the assessed SMEs all have a leadership with ambition supported by a modern IT infrastructure, the further implementation is hindered by a limited effort towards process improvement initiatives. Issues are resolved in a reactive manner and processes only change when something goes wrong. There is generally no documentation to fall back on, nor metrics to proactively improve certain aspects of the process(es). People are often used to their jobs, which tend to be rather multidimensional, and react rather reluctant towards changes within their jobs or the company. To resolve this, companies should be willing to implement certain changes (practices, jobs) and be prepared to change the mindset of the employees as well as the leadership.

Part 3: *How can the elements which are inhibiting the further implementation of BPM be remedied to advance the BPM of the organisation?*

Based on the inhibiting elements, the researchers defined improvement initiatives to advance the BPM level to a realistic maturity level based on a qualitative approach for each SME separately. As these recommendations are based upon BPMMs, the question remains what the impact is on BPM. To determine which elements of BPM are affected the most by these improvements, they are subdivided over the six 'core' elements of BPM defined by Rosemann and vom Brocke (2015) (table 36).

Table 36: Recommendations organised by BPM 'core' elements (Rosemann & vom Brocke, 2015)

Core element	Subcategory	Improvement initiative
Strategic Alignment	Governance-Process model	Design an Enterprise Architecture (EA) model (*Fero, Vossaert, Maes*)
Governance	Owner-Identity	Create official role for process owner, with authority and control over part of the business (*Fero, Vossaert*)
	Leadership-Behavior	Shift part of the workload from management to other employees (*Vossaert*)
	Owner-Activities	Define process performance goals & vision on future improvements (*Fero, Vossaert*)
Methods	Design-Documentation	Develop an extensive process documentation (*Fero, Vossaert*)
	Metrics-Definition & Uses	Define and employ end-to-end process metrics (*Fero, Vossaert, Maes*)
	Leadership-Alignment	Create company-wide standards to resolve issues (*Fero, Vossaert, Maes*)
IT	Infrastructure-IT systems	Prepare IT systems for the addition of relevant process metrics (*Fero, Vossaert, Maes*)
People	Culture-Teamwork	Install cross-functional teams for process improvements (*Fero, Vossaert*)
	Owner-Activities	Identification, improvement and communication of the process (*Fero, Vossaert*)
	Expertise-People	Empower employee(s) in process modelling and change management (*Vossaert*)
Culture	Culture-Customer focus	Involve employees in financial situation (*Vossaert*)
	Culture-Attitude toward change	Engage employees by being more transparent about the company's strategy, vision and mission (*Maes*)
	Performers-Knowledge	Make KPIs visible to every empoloyee (*Maes*)

Structuring the improvement initiatives in this manner gives a comprehensive overview of the different needs per BPM success factor. The omission of Fisher's BPMM made it difficult to assess the **Strategic alignment** element (cf. supra). Nonetheless, the Enterprise Architecture models designed by the researchers could be expanded with a strategy layer. In this way, enterprises can link their overall strategy and the business processes. Consequently, they might succeed partly in capturing the strategic alignment element, while PEMM and BPO sufficiently cover the remaining core elements. The strength of the **IT infrastructure** in the considered SMEs is clear as well from the table, as the only recommendation is to prepare it for process metrics. Relative to the other core elements, IT performs well. For the **Governance** element, the SMEs are encouraged to shift some authority to employees, define clear performance goals and develop a vision for the future. Concerning **Methods**, the main recommendations are to document the business processes, installing relevant metrics and devise standard methodologies. The **People** element can be enhanced by investing in employees, empowering them in process modelling practices and improving cross-functional communication and collaboration. **Culture**, the final element, might be the most difficult one to address. Installing new tools, systems or jobs is something which can be controlled. Changing the mindset of employees however cannot be done as easily in the short to medium term.

6.1 BPM challenges for SMEs

Now that the inhibiting elements in the three Belgian SMEs are identified, one can ask the question whether these correspond to the ones found in literature. In section 3.4.1, the researchers identified the most prominent BPM challenges for SMEs reported in literature. Of course, these challenges are broader than the more specific inhibiting elements. It is self-evident that a **lack of financial resources** or a **lack of time** may cause any of the aforementioned inhibiting elements. The other most reported general challenges are easier to compare to the specific inhibiting elements found in the SMEs. For instance, it is safe to say that the challenge **lack of process-oriented approaches** is omnipresent in the examined SMEs. Process documentation is barely in place, which makes it difficult to identify improvement initiatives. Process related metrics are generally underdeveloped, and are not related to specific process performance goals. Another challenge which has proven its relevance is **lack of expertise.** On the one hand, employees across the three SMEs indeed lack sufficient BPM related expertise, such as process modelling or change management competencies to enable the transition toward a higher level of maturity. On the other hand, IT expertise proves not to be a significant inhibiting element relative to the other ones. Across the three SMEs, IT systems are in place which support important business processes. Nonetheless, relevant process metrics to monitor processes and/or to set out ambitious process performance goals are not implemented in these IT systems. Furthermore, the challenge **lack of human resources and multiple roles of employees** was identified as well. Jobs in the SMEs are usually multidimensional, which makes it hard to identify final responsibilities for business processes, i.e. the so-called process owners. For the three SMEs, the upper management is charged with control over the bulk of the important business processes. A challenge which is not identified is the **lack of support from senior management** (at least, it is not labelled as one of the most inhibiting elements). Relative to the other elements, the support from the company's leadership in the management of the processes does not constrain the transition toward a higher BPM level.

6.2 Limitations

The researchers were confronted with certain limitations for this study. A first issue was the lack of time. On the one hand, as this is a master dissertation, the research had to be conducted within roughly one year. On the other hand, the lack of time was also with the companies, who were willing to cooperate, but understandably could only grant the researchers limited attention. The day-to-day operations were always prioritised, which led to some last-minute shifts in the appointment schedules. Second, there was the lack of financial resources. As this is an academic research, the SMEs had to be convinced of the value it could deliver for them. Despite these limitations, the researchers succeeded in conducting the research as designed.

6.3 Future research

As this case study research is not able to provide a statistical analysis of the results, it can only indicate which findings might be generalisable for SMEs, while the external validity remains unclear. A broader investigation in a large group of companies could expose BPM inhibiting elements inherent to SMEs in general. Comparing these results to the existing literature on large enterprises can deliver interesting insights on the elements of BPM that should be modified to be more appealing to SMEs as a discipline.

Further, as the researchers have fine-tuned the existing model of HAM-PEMM to the needs of SMEs, the omitted elements can be reviewed (i.e. Governance and Infrastructure-Human resource systems). Moreover, rather than dropping elements from the existing models designed for large enterprises, they could be supplemented with other, more relevant items for SMEs. This may be accomplished by combining certain maturity models to make them more exhaustive. For instance, the PEMM does not sufficiently succeed in capturing the Strategic Alignment component, one of the six core elements of BPM defined by Rosemann and vom Brocke (2015). Expanding this model could enable it to serve as an all-encompassing maturity model for SMEs.

A challenge that this study has not been able to tackle is the link between BPM and its contribution to corporate value. As described in section 3.1.2, this remains one of the hardest challenges for the discipline. The statement of Burlton (2011) that measurable results are required to demonstrate BPM success requires an extensive investigation. First, the current state of BPM should be determined, as has been done in this study. Next, improvement initiatives have to be defined, which was still within the scope of this research. In order to be able to prove BPM success, these recommendations need to be implemented, followed by a comparative analysis of business performance before and after the changes. The limitations of the researchers such as the lack of time, made a study of this magnitude infeasible.

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Appendix

Exhibit 1: Selection procedure of SMEs

Exhibit 2: Maturity models

Exhibit 3: Data analysis PEMM Hammer

Exhibit 4: Data analysis BPO McCormack

Exhibit 5: Enterprise Architectures of order fulfilment process

Exhibit 1: Selection procedure of SMEs

Based on the three formulated criteria, the procedure to select well-suited SMEs consists of five clearly outlined steps.

Step 1: Identification of potential candidates

The researchers started with a broad range of SMEs, before narrowing them down to two or three enterprises which are perceived well-suited. First, they did a screening of the SMEs in their personal network. A list of 24 enterprises was established, accompanied by their sectors.

	Company	Sector
1	**Divico**	Information Technology
2	**Tradelio**	Food
3	**LogisolPro**	Logistics
4	**Kodibox**	Removal firm
5	**Aircompact**	Industrial equipment
6	**ANG**	Containers and metal products
7	**Twikit**	Information Technology
8	**Cube**	Food
9	**Nestor**	Human Resources
10	**Bucomat**	Cattle feed and agricultural products
11	**Ekopak**	Wastewater treatment
12	**Extremis**	Interior
13	**Maes Compressors**	Industrial equipment
14	**Marfashion**	Textile
15	**Procotex**	Textile
16	**GMP**	Plastic materials
17	**Fero**	Heating and construction
18	**Vossaert Kitchens-Interior**	Interior
19	**Momentsfurniture**	Interior
20	**Dekeyzer-Ossaer**	Food
21	**Vande Moortel**	Stone bakery
22	**Concordia Textiles**	Textile
23	**Muldernatural Foods**	Food
24	**Vandemoortele**	Food

Step 2: Compliance with SME definition

In order to know whether the enterprises comply with the SME definition, the tool ‘NBB consult’ was used. NBB consult is a tool from the National Bank of Belgium through which anybody can access all the financial annual accounts of Belgian enterprises since 1992. By having access to those annual accounts, one can determine the employment (expressed in Full Time Equivalents (FTE)), the annual turnover and the balance sheet total of the latest financial year. These three measures are displayed per enterprise in the table below.

Some remarks must be made:

1. The financial statements do not include the management in the employment in FTE.
2. Some enterprises only have to submit a condensed financial account, in which they do not have to indicate the annual turnover. When this is the case, the gross margin is considered.

	Company	Sector	Employment (FTE)	Turnover/ *Gross margin*	Balance sheet total
1	Divico	Information Technology	missing	missing	missing
2	Tradelio	Food	missing	missing	missing
	Micro				
3	LogisolPro	Logistics	missing	*€ 132 316*	€ 1 064 619
4	Kodibox	Removal firm	4	*€ -199 778*	€ 165 116
5	Aircompact	Industrial equipment	10	*€ 783 619*	€ 1 717 862
	Small				
6	ANG	Containers and metal products	4	*€ 298 011*	€ 2 469 958
7	Twikit	Information Technology	11	*€ -150 115*	€ 787 553
8	Cube	Food	12	*€ 844 691*	€ 1 973 594
9	Nestor	Human Resources	14	*€ 344 799*	€ 314 564
10	Bucomat	Cattle feed and agricultural products	14	*€ 1 054 416*	€ 2 389 412
11	Ekopak	Wastewater treatment	16	*€ 1 430 290*	€ 3 456 344
12	Extremis	Interior	25	*€ 1 857 380*	€ 4 275 094
13	Maes Compressors	Industrial equipment	37	€ 7 790 472	€ 4 516 971
	Medium-sized				
14	Marfashion	Textile	40	*€ 1 530 678*	€ 1 759 375
15	Procotex	Textile	28	€ 36 969 646	€ 25 836 182
16	GMP	Plastic materials	30	€ 10 707 540	€ 5 766 184
18	Fero	Heating and construction	51	€ 24 601 249	€ 14 140 462
17	Vossaert Kitchens-Interior	Interior	54	*€ 3 115 148*	€ 5 251 442
19	Momentsfurniture	Interior	62	€ 14 728 287	€ 8 417 327
20	Dekeyzer-Ossaer	Food	64	€ 20 378 037	€ 11 624 414
21	Vande Moortel	Stone bakery	95	€ 25 135 457	€ 15 428 710
22	Concordia Textiles	Textile	242	€ 41 566 120	€ 24 566 459
	Large				
23	Vandemoortele	Food	68	€ 461 815 135	€ 678 780 225
24	Muldernatural Foods	Food	170	€ 119 374 271	€ 53 713 946

As one can tell from the table, some information could not be found, and therefore, those SMEs ('Divico' and 'Tradelio') are not considered anymore. After having categorised the enterprises according to the EU recommendation 2003/361, it appears that three of them are micro enterprises, eight enterprises are small, nine represent medium-sized enterprises, while two large enterprises could be detected. Since this study is about SMEs, the two large enterprises 'Muldernatural Foods' and 'Vandemoortele' are beyond the scope of this study and will not be considered anymore. After the first stage, the number of potential candidates is reduced from 24 to 20.

Step 3: Arousal of interest

The 20 SMEs identified in step 2 were approached by email in May 2017. The email served primarily to arouse interest in the general topic of this study: 'BPM in SMEs', since the research question was not determined yet. The email briefly explained the definition of Business Process Management and introduced the general topic. Additionally, the SMEs were asked if they would be possibly interested to cooperate with the study. From the 20 potential candidates, 10 SMEs replied that they would be interested. The remaining SMEs are highlighted in yellow in the table below.

	Company	Sector	Employment (FTE)	Turnover/ *Gross margin*	Balance sheet total
1	Divico	Information Technology	missing	missing	missing
2	Tradelio	Food	missing	missing	missing
	Micro				
3	LogisolPro	Logistics	missing	€ *132 316*	€ 1 064 619
4	Kodibox	Removal firm	4	€ *-199 778*	€ 165 116
5	Aircompact	Industrial equipment	10	€ *783 619*	€ 1 717 862
	Small				
6	ANG	Containers and metal products	4	€ *298 011*	€ 2 469 958
7	Twikit	Information Technology	11	€ *-150 115*	€ 787 553
8	Cube	Food	12	€ *844 691*	€ 1 973 594
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	Medium-sized				
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21	Vande Moortel	Stone bakery	95	€ 25 135 457	€ 15 428 710
22	Concordia Textiles	Textile	242	€ 41 566 120	€ 24 566 459
	Large				
23	Vandemoortele	Food	68	€ 461 815 135	€ 678 780 225
24	Muldernatural Foods	Food	170	€ 119 374 271	€ 53 713 946

Step 4: Explanation of the study

In October 2017, the initial topic was fine-tuned and the research question formulated. Subsequently, a second email was sent to the ten remaining SMEs. In this email, the fine-tuned research approach was formulated, accompanied by the research question. To continue, the email clearly stated how many contact points would be required (three), and how much time these contact points would approximately take. From the remaining ten SMEs, six answered that they were still interested. They are highlighted in green in the table below.

	Company	Sector	Employment (FTE)	Turnover/ *Gross margin*	Balance sheet total
1	Divico	Information Technology	missing	missing	missing
2	Tradelio	Food	missing	missing	missing
	Micro				
3	LogisolPro	Logistics	missing	*€ 132 316*	€ 1 064 619
4	Kodibox	Removal firm	4	*€ -199 778*	€ 165 116
5	Aircompact	Industrial equipment	10	*€ 783 619*	€ 1 717 862
	Small				
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	Large				
23	Vandemoortele	Food	68	€ 461 815 135	€ 678 780 225
24	Muldernatural Foods	Food	170	€ 119 374 271	€ 53 713 946

Step 5: Selection of SMEs

The six remaining SMEs consist of one micro, two small and three medium-sized enterprises. As previously mentioned, the study is conducted with two or three enterprises, due to feasibility reasons. Subsequently, three enterprises had to be picked from the remaining list of six enterprises. Since it has been decided not to consider any micro enterprises, five SMEs remain. Although the balance sheet total of 'ANG' exceeds the 2 million euro threshold, it has been decided to reject it as well, since it has too many similarities with a micro enterprise. Consequently, four enterprises are left which comply with criteria 1, 2 and 3; one small ('Maes Compressors') and three medium-sized enterprises ('Marfashion', 'Fero' and 'Vossaert Kitchens-Interior'). Although classified into two different categories, the four enterprises show some resemblances in terms of employment. However, in terms of turnover and balance sheet total, Fero clearly outperforms the others. Therefore, Fero is already considered a good fit for the case study. Now, two enterprises still need to be selected out of a list of three. The researchers agreed on 'Maes Compressors' and 'Vossaert Kitchens-Interior' to do the assessment, while keeping 'Marfashion' as a potential back-up. The three SMEs selected for the case study are highlighted in blue in the table below.

	Company	Sector	Employment (FTE)	Turnover/ *Gross margin*	Balance sheet total
1	Divico	Information Technology	missing	missing	missing
2	Tradelio	Food	missing	missing	missing
	Micro				
3	LogisolPro	Logistics	missing	*€ 132 316*	€ 1 064 619
4	Kodibox	Removal firm	4	*€ -199 778*	€ 165 116
5	Aircompact	Industrial equipment	10	*€ 783 619*	€ 1 717 862
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	Large				
23	Vandemoortele	Food	68	€ 461 815 135	€ 678 780 225
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Exhibit 2: Maturity models

1 Hammer – Process and Enterprise Maturity Model (PEMM)

Enterprise maturity

To be used in conjunction with "The Process Audit" by Michael Hammer (HBR April 2007, Reprint R0704H).

How Mature Is Your **ENTERPRISE?**

To determine if your organization is ready to support a process-based transformation, evaluate the statements in this table. They show the strength levels, from E-1 to E-4, of the capabilities that enterprises need in order to develop their business processes. If a statement is at least 80% correct, color the cell green; if it is between 20% and 80% correct, shade it yellow; and if it is less than 20% correct, make it red.

GREEN: largely true | YELLOW: somewhat true | RED: largely untrue

		E-1	E-2	E-3	E-4	GREEN: largely true	YELLOW: somewhat true	RED: largely untrue
						E-1	E-2	E-3	E-4
Leadership	Awareness	The enterprise's senior executive team recognizes the need to improve operational performance but has only a limited understanding of the power of business processes.	At least one senior executive deeply understands the business process concept, how the enterprise can use it to improve performance, and what is involved in implementing it.	The senior executive team views the enterprise in process terms and has developed a vision of the enterprise and its processes.	The senior executive team sees its own work in process terms and perceives process management not as a project but as a way of managing the business.				
	Alignment	The leadership of the process program lies in the middle management ranks.	A senior executive has taken leadership of, and responsibility for, the process program.	There is strong alignment in the senior executive team regarding the process program. There is also a network of people throughout the enterprise helping to promote process efforts.	People throughout the enterprise exhibit enthusiasm for process management and play leadership roles in process efforts.				
	Behavior	A senior executive endorses and invests in operational improvement.	A senior executive has publicly set stretch performance goals in customer terms and is prepared to commit resources, make deep changes, and remove roadblocks in order to achieve those goals.	Senior executives operate as a team, manage the enterprise through its processes, and are actively engaged in the process program.	The members of the senior executive team perform their own work as processes, center strategic planning on processes, and develop new business opportunities based on high-performance processes.				
	Style	The senior executive team has started shifting from a top-down, hierarchical style to an open, collaborative style.	The senior executive team leading the process program is passionate about the need to change and about process as the key tool for change.	The senior executive team has delegated control and authority to process owners and process performers.	The senior executive team exercises leadership through vision and influence rather than command and control.				
Culture	Teamwork	Teamwork is project focused, occasional, and atypical.	The enterprise commonly uses cross-functional project teams for improvement efforts.	Teamwork is the norm among process performers and is commonplace among managers.	Teamwork with customers and suppliers is commonplace.				
	Customer Focus	There is a widespread belief that customer focus is important, but there is limited appreciation of what that means. There is also uncertainty and conflict about how to meet customers' needs.	Employees realize that the purpose of their work is to deliver extraordinary customer value.	Employees understand that customers demand uniform excellence and a seamless experience.	Employees focus on collaborating with trading partners to meet the needs of final customers.				
	Responsibility	Accountability for results rests with managers.	Frontline personnel begin to take ownership of results.	Employees feel accountable for enterprise results.	Employees feel a sense of mission in serving customers and achieving ever-better performance.				
	Attitude Toward Change	There is growing acceptance in the enterprise about the need to make modest change.	Employees are prepared for significant change in how work is performed.	Employees are ready for major multidimensional change.	Employees recognize change as inevitable and embrace it as a regular phenomenon.				
Expertise	People	A small group of people has a deep appreciation for the power of processes.	A cadre of experts has skills in process redesign and implementation, project management, communications, and change management.	A cadre of experts has skills in large-scale change management and enterprise transformation.	Substantial numbers of people with skills in process redesign and implementation, project management, program management, and change management are present across the enterprise. A formal process for developing and maintaining that skill base is also in place.				
	Methodology	The enterprise uses one or more methodologies for solving execution problems and making incremental process improvements.	Process redesign teams have access to a basic methodology for process redesign.	The enterprise has developed and standardized a formal process for process redesign and has integrated it with a standard process for process improvement.	Process management and redesign have become core competencies and are embedded in a formal system that includes environment scanning, change planning, implementation, and process-centered innovation.				
Governance	Process Model	The enterprise has identified some business processes.	The enterprise has developed a complete enterprise process model, and the senior executive team has accepted it.	The enterprise process model has been communicated throughout the enterprise, is used to drive project prioritization, and is linked to enterprise-level technologies and data architectures.	The enterprise has extended its process model to connect with those of customers and suppliers. It also uses the model in strategy development.				
	Accountability	Functional managers are responsible for performance, project managers for improvement projects.	Process owners have accountability for individual processes, and a steering committee is responsible for the enterprise's overall progress with processes.	Process owners share accountability for the enterprise's performance.	A process council operates as the seniormost management body; performers share accountability for enterprise performance; and the enterprise has established steering committees with customers and suppliers to drive interenterprise process change.				
	Integration	One or more groups advocate and support possibly distinct operational improvement techniques.	An informal coordinating body provides needed program management while a steering committee allocates resources for process redesign projects.	A formal program management office, headed by a chief process officer, coordinates and integrates all process projects, and a process council manages interprocess integration issues. The enterprise manages and deploys all process improvement techniques and tools in an integrated manner.	Process owners work with their counterparts in customer and supplier enterprises to drive interenterprise process integration.				

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Source: Hammer (2007)

Source: *Hammer (2007)*

To be used in conjunction with "The Process Audit" by Michael Hammer (HBR April 2007, Reprint R0704H).

How Mature Are Your PROCESSES?

You can evaluate the maturity of a business process and determine how to improve its performance by using this table. Decide how the statements defining the strength levels, from P-1 to P-4, for each enabler apply to the process that you are assessing. If a statement is largely true (at least 80% correct), color the cell green; if it is somewhat true (between 20% and 80% correct), shade the cell yellow; and if it is largely untrue (less than 20% correct), mark the cell red.

GREEN: largely true | YELLOW: somewhat true | RED: largely untrue

Process maturity

		P-1	P-2	P-3	P-4
Design	Purpose	The process has not been designed on an end-to-end basis. Functional managers use the legacy design primarily as a context for functional performance improvement.	The process has been redesigned from end to end in order to optimize its performance.	The process has been designed to fit with other enterprise processes and with the enterprise's IT systems in order to optimize the enterprise's performance.	The process has been designed to fit with customer and supplier processes in order to optimize interenterprise performance.
	Context	The process's inputs, outputs, suppliers, and customers have been identified.	The needs of the process's customers are known and agreed upon.	The process owner and the owners of the other processes with which the process interfaces have established mutual performance expectations.	The process owner and the owners of customer and supplier processes with which the process interfaces have established mutual performance expectations.
	Documentation	The documentation of the process is primarily functional, but it identifies the interconnections among the organizations involved in executing the process.	There is end-to-end documentation of the process design.	The process documentation describes the process's interfaces with, and expectations of, other processes and links the process to the enterprise's system and data architecture.	An electronic representation of the process design supports its performance and management and allows analysis of environmental changes and process reconfigurations.
Performers	Knowledge	Performers can name the process they execute and identify the key metrics of its performance.	Performers can describe the process's overall flow; how their work affects customers, other employees in the process, and the process's performance; and the required and actual performance levels.	Performers are familiar both with fundamental business concepts and with the drivers of enterprise performance and can describe how their work affects other processes and the enterprise's performance.	Performers are familiar with the enterprise's industry and its trends and can describe how their work affects interenterprise performance.
	Skills	Performers are skilled in problem solving and process improvement techniques.	Performers are skilled in teamwork and self-management.	Performers are skilled at business decision making.	Performers are skilled at change management and change implementation.
	Behavior	Performers have some allegiance to the process, but owe primary allegiance to their function.	Performers try to follow the process design, perform it correctly, and work in ways that will enable other people who execute the process to do their work effectively.	Performers strive to ensure that the process delivers the results needed to achieve the enterprise's goals.	Performers look for signs that the process should change, and they propose improvements to the process.
Owner	Identity	The process owner is an individual or a group informally charged with improving the process's performance.	Enterprise leadership has created an official process owner role and has filled the position with a senior manager who has clout and credibility.	The process comes first for the owner in terms of time allocation, mind share, and personal goals.	The process owner is a member of the enterprise's seniormost decision-making body.
	Activities	The process owner identifies and documents the process, communicates it to all the performers, and sponsors small-scale change projects.	The process owner articulates the process's performance goals and a vision of its future; sponsors redesign and improvement efforts; plans their implementation; and ensures compliance with the process design.	The process owner works with other process owners to integrate processes to achieve the enterprise's goals.	The process owner develops a rolling strategic plan for the process, participates in enterprise-level strategic planning, and collaborates with his or her counterparts working for customers and suppliers to sponsor interenterprise process-redesign initiatives.
	Authority	The process owner lobbies for the process but can only encourage functional managers to make changes.	The process owner can convene a process redesign team and implement the new design and has some control over the technology budget for the process.	The process owner controls the IT systems that support the process and any projects that change the process and has some influence over personnel assignments and evaluations as well as the process's budget.	The process owner controls the process's budget and exerts strong influence over personnel assignments and evaluations.
Infrastructure	Information Systems	Fragmented legacy IT systems support the process.	An IT system constructed from functional components supports the process.	An integrated IT system, designed with the process in mind and adhering to enterprise standards, supports the process.	An IT system with a modular architecture that adheres to industry standards for interenterprise communication supports the process.
	Human Resource Systems	Functional managers reward the attainment of functional excellence and the resolution of functional problems in a process context.	The process's design drives role definitions, job descriptions, and competency profiles. Job training is based on process documentation.	Hiring, development, reward, and recognition systems emphasize the process's needs and results and balance them against the enterprise's needs.	Hiring, development, reward, and recognition systems reinforce the importance of intra- and interenterprise collaboration, personal learning, and organizational change.
Metrics	Definition	The process has some basic cost and quality metrics.	The process has end-to-end process metrics derived from customer requirements.	The process's metrics as well as cross-process metrics have been derived from the enterprise's strategic goals.	The process's metrics have been derived from interenterprise goals.
	Uses	Managers use the process's metrics to track its performance, identify root causes of faulty performance, and drive functional improvements.	Managers use the process's metrics to compare its performance to benchmarks, best-in-class performance, and customer needs and to set performance targets.	Managers present the metrics to process performers for awareness and motivation. They use dashboards based on the metrics for day-to-day management of the process.	Managers regularly review and refresh the process's metrics and targets and use them in strategic planning.

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Exhibit 2: 2/4

2 McCormack – Business Process Orientation (BPO)

Final Survey Questions

Process View

1. The average employee views the business as a series of linked processes.
2. Process terms such as input, output, process and process owners are used in conversation in the organization.
3. The business processes are sufficiently defined so that most employees know how they work.

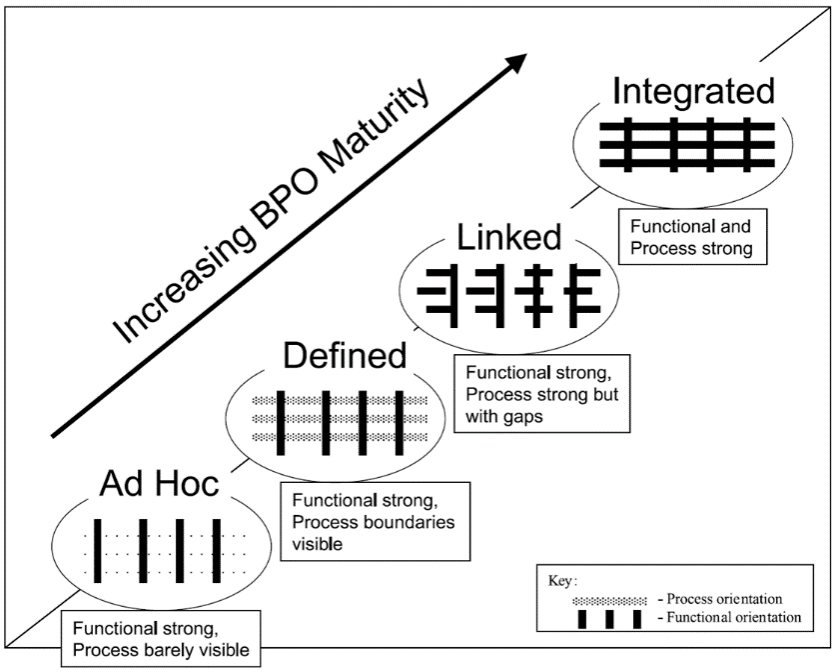
Process Jobs

1. Jobs are usually multidimensional and not just simple tasks.
2. Jobs include frequent problem solving.
3. Employees are constantly learning new things on the job.

Process Management and Measurement Systems

1. Process performance is measured.
2. Process measurements are defined.
3. Resources are allocated based on process.
4. Specific process performance goals are in place.
5. Process outcomes are measured.

Source: McCormack (2001)

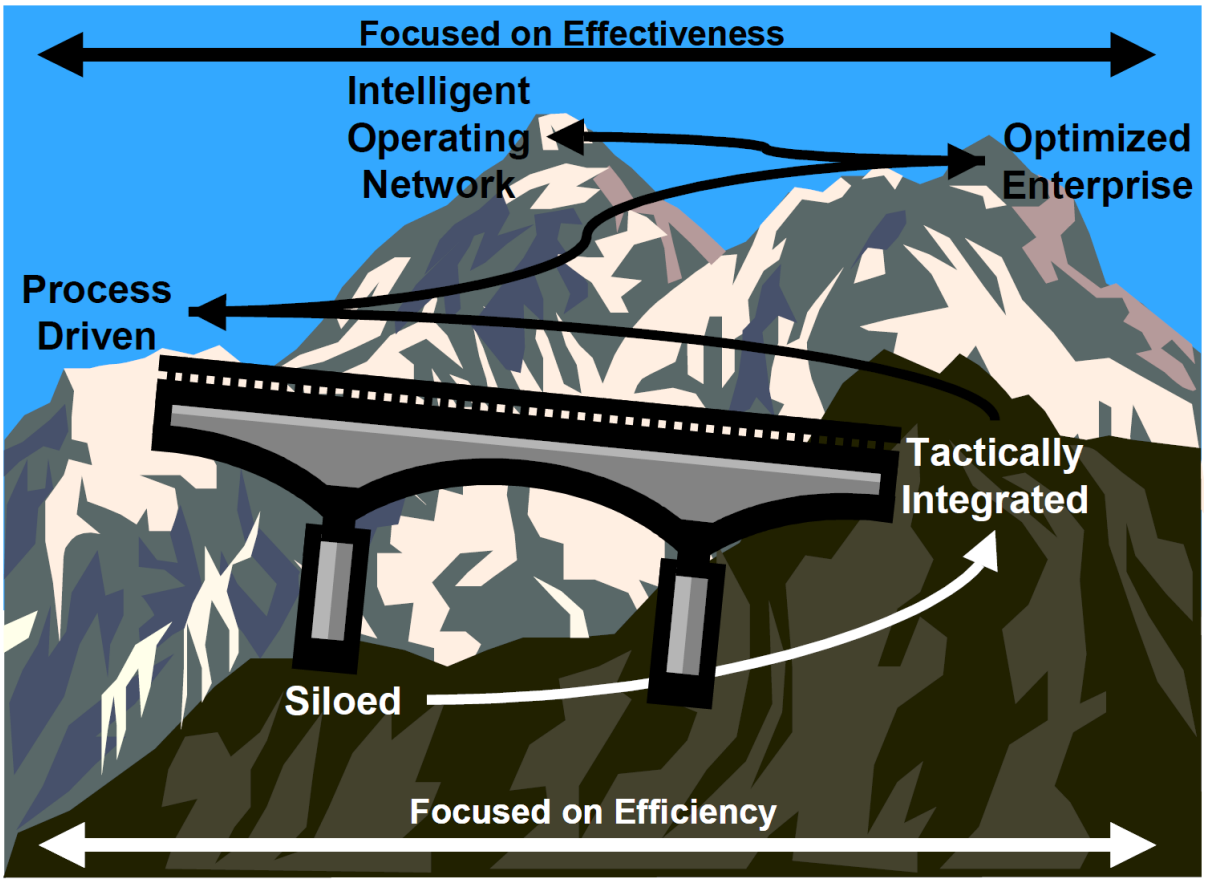


Source: McCormack & Johnson (2001)

3 Fisher – Business Process Maturity Model (BPMM)

	Siloed	Tactically Integrated	Process Driven	Optimized Enterprise	Intelligent Operating Network
Strategy	• Reactive to market conditions within 1-2 years, typically chasing a competitor • Integration within functions • Driven by cost and efficiency	• Adapt/react to market dynamics within 12 months • Some cross-functional integration to solve pains • Initial entry into point-to-point integration with partners	• Adapt/react to market dynamics within 3-6 months • Enterprise-wide process leadership is established • The business process is the foundational element of the enterprise	• Adaptive to market dynamics within weeks • Enterprise organized completely around processes • Optimized processes+execution yield competitive advantage	• Predictive capabilities and market leadership • Continuously adaptive to market dynamics in near real-time • Enterprise and its partners are organized around processes • Competitive advantage is driven and shared by partners
Controls	• Local and functional level authority / autonomy • No enterprise-wide standards or governance • No formal value measurement program	• Hierarchical mgmt. structure • Independent functional department decisions • Limited enterprise-wide standards or governance	• Formal process leadership establishes priorities • Business cases drive projects • Process metrics tied to individual and team performance	• Process teams responsible for overall performance • Relevant process metrics institutionalized as main performance measures	• Inter-enterprise process teams own performance • Relevant process metrics are used to measure bi-directional partner performance
Process	• Static business processes • Functional silos • Geographic silos • Department focused • Informal communications within departments	• Limited process reengineering and cross-functional/process coordination (often manual, one-time efforts) • Systems drive baseline process definitions	• Fully transitioned from functional to process focus, including management structure, execution teams, and performance evaluation • Targeted BPO	• Total process integration across the enterprise • Commitment to continuous process improvement program • Outsource non-core business processes (reduce cost and increase quality)	• Total process integration across the ecosystem • Key processes flow seamlessly across firewalls
People	• Subject matter experts • Culture is adversarial, mutual distrust • No formal change management procedures • I'll do my job, you do yours	• Cross-functional/process team members (usually led by IT) • Limited understanding of cross-departmental process needs and dependencies	• Process leaders define, deploy, enhance, and maintain core processes • Functional teams focus on high quality execution	• Lean organization focused on optimizing process definitions and execution • Ongoing process training for employees	• Partner selection includes process & cultural attributes • Ongoing process training for employees and partners
IT	• Independent systems • Islands of automation • Integration only within functions • Legacy enterprise system(s)	• Leverage ERP systems for cross-functional integration • Point-to-point partner integration • IT leads cross-functional initiatives (systems focused)	• IT supports process leadership team in initiatives • System and instance consolidation to streamline processes and info mgmt.	• Utilize Business Process Management (BPM) solutions to automate process execution, monitoring, and control across the Enterprise	• Utilize Business Process Management (BPM) solutions to automate and monitor process execution throughout the ecosystem

Source: Fisher (2004)



Source: Fisher (2004)

Exhibit 3: Data analysis PEMM Hammer

Structure model

- **Assessment items (AI):** 26 (= subcategories)
- **Maturity scale:** 0-4
- **Maturity questionnaire:** per AI; description of statement for levels 1 to 4 + colour code
  - Green: largely true (statement is at least 80% correct)
  - Yellow: somewhat true (statement is between 20% and 80% correct)
  - Red: largely untrue (statement is less than 20% correct)
- **Maturity calculation:** min. score for the yellow colour code among all items = maturity stage
- **Maturity stages:** 4

  Distinction is made between maturity of the Enterprise (E) and of the Processes (P).

  One can only advance to the next process level if the enterprise has already reached that level.
  - E-1 / P-1: Reliable and predictable
  - E-2 / P-2: Superior results
  - E-3 / P-3: Optimal performance
  - E-4 / P-4: Best-in-class
- **BPM categories:** 9 (= PEMM categories)
  - Enterprise Capabilities: 4
    - Leadership
    - Culture
    - Expertise
    - Governance
  - Process Enablers: 5
    - Design
    - Performers
    - Owner
    - Infrastructure
    - Metrics
- **BPM subcategories:** 26 (= PEMM subcategories): Leadership: 4, Culture: 4, Expertise: 2, Governance: 3, Design: 3, Performers: 3, Owner: 3, Infrastructure: 2, Metrics: 2

Finetuning Model

- First fine-tuning step: irrelevant AIs for the SMEs (4): *Methodology, Accountability, Integration, HR Systems*
  - Decided together with the upper management of the assessed companies.

- Second fine-tuning step: irrelevant AIs for the lower management (6): *Awareness, Alignment, Behaviour, Information Systems, Definition, Uses*
    - These are mainly objective AIs, which can only be assessed veraciously by the company leader.

Assessment Steps Hammer

For Upper and Lower Management

1. Transform coloured cells using a number key: Green -> 2, Yellow -> 1 & Red -> 0
    a. Eliminate erroneous data (wrong colour code)
    b. Calculate average per AI, which will be in the range of [0,2]
2. Sort the assessment items by value (highest -> lowest) and make a boxplot of the AIs
    a. Determine descriptive statistics
        i. Minimum, Maximum, Mean, Median
        ii. Assessment items ≥ Q3 and ≤ Q1 on boxplot

Discrepancies

1. Detect returning assessment items that are ≥ Q3 or ≤ Q1 for both upper and lower management
    a. Eliminate AIs only relevant for the upper management from the list
2. Determine assessment items where scores given by upper and lower management differ the most by subtracting the scores and make a boxplot of the results
    a. Determine descriptive statistics

Comparison main categories and subcategories (=AIs)

1. Use three cases separately as a benchmark to detect patterns
2. Make a ranking for the three cases combined
3. Situate (sub) categories on the ranking of the individual companies

1 Fero

1.1 Upper Management

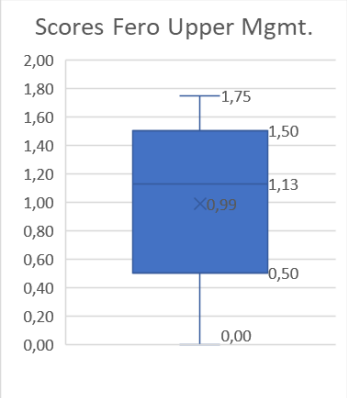
Step 1: Apply number key and calculate average score

ENTERPRISE		CEO				COO				Upper mgmt
		E1	E2	E3	E4	E1	E2	E3	E4	
Leadership	Awareness	2	2	2	1	2	2	2	1	1,75
	Alignment	2	2	2	1	2	2	2	1	1,75
	Behavior	2	1	1	1	2	1	1	1	1,25
	Style	2	2	1	1	2	2	1	1	1,50
Culture	Teamwork	2	0	0	0	2	0	0	0	0,50
	Customer Focus	2	1	1	1	2	1	1	1	1,25
	Responsibility	2	2	1	1	2	2	1	1	1,50
	Attitude change	2	1	0	0	2	1	0	0	0,75
Expertise	People	2	2	0	0	2	2	0	0	1,00
	Methodology	x	x	x	x	x	x	x	x	x
Governance	Process Model	2	0	0	0	2	0	0	0	0,50
	Accountability	x	x	x	x	x	x	x	x	x
	Integration	x	x	x	x	x	x	x	x	x

PROCESSES		CEO				COO				Upper mgmt
		P1	P2	P3	P4	P1	P2	P3	P4	
Design	Purpose	2	2	2	1	2	2	2	1	1,75
	Context	2	1	1	1	2	1	1	1	1,25
	Documentation	0	0	0	0	0	0	0	0	0,00
Performers	Knowledge	2	2	1	0	2	2	1	0	1,25
	Skills	2	1	0	0	2	1	0	0	0,75
	Behavior	2	2	1	0	2	2	1	0	1,25
Owner	Identity	2	1	0	0	2	1	0	0	0,75
	Activities	0	0	0	0	0	0	0	0	0,00
	Authority	2	2	0	0	2	2	0	0	1,00
Infrastructure	IT Systems	2	2	2	0	2	2	2	0	1,50
	HR Systems	x	x	x	x	x	x	x	x	x
Metrics	Definition	1	0	0	0	1	0	0	0	0,25
	Uses	1	0	0	0	1	0	0	0	0,25

Step 2: Sort by value and make a boxplot of the assessment items

Upper Management	
Awareness	1,75
Alignment	1,75
Purpose	1,75
Style	1,50
Responsibility	1,50
IT Systems	1,50
Behavior (Perform)	1,25
Customer Focus	1,25
Context	1,25
Knowledge	1,25
Behavior (Leader)	1,25
People	1,00
Authority	1,00
Attitude change	0,75
Skills	0,75
Identity	0,75
Teamwork	0,50
Process Model	0,50
Definition	0,25
Uses	0,25
Documentation	0,00
Activities	0,00



Descriptives

Min score: 0,00

Max score: 1,75

Mean: 0,99

Median: 1,13

≥ Q3:

Awareness, *Alignment*, Purpose, Style, Responsibility, *IT systems*

≤ Q1:

Teamwork, Process Model, *Definition*, *Uses*, Documentation, Activities

(In italic: Only assessed by upper mgmt.)

1.2 Lower Management

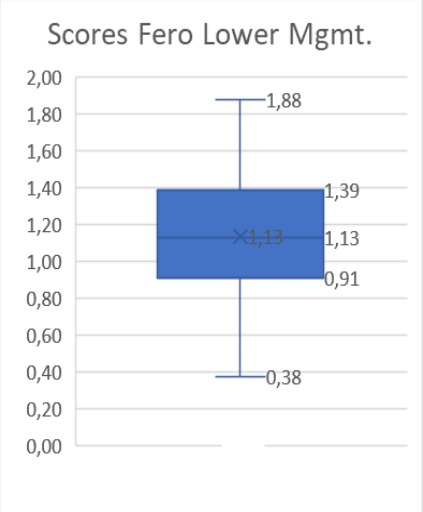
Step 1: Apply number key and calculate average score

ENTERPRISE		Head of accountancy				Head of after sales service				Warehouse manager				Sales & Marketing				Project manager				Lower Mgmt
		E1	E2	E3	E4	E1	E2	E3	E4	E1	E2	E3	E4	E1	E2	E3	E4	E1	E2	E3	E4	
Leadership	Awareness	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Alignment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Behavior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Style	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0					0,38
Culture	Teamwork	2	2	2	2	2	2	2	2					2	2	1	1	2	2	2	2	1,88
	Customer Focus	2	1	1	1	2	2	1	0	2	2	1	1	2	2	1	0	2	2	1	1	1,35
	Responsibility	2	2	1	1	2	2	2	2					1	1	1	1	2	2	2	2	1,63
	Attitude change	1	1	1	1	2	1	1	0					1	0	0	0					0,75
Expertise	People	2	2	2	1	1	0	0	0	2	1	1	1	1	1	0	0	1	1	1	0	0,90
	Methodology	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Governance	Process Model	2	2	2	1	1	1	0	0	2	2	2	0	2	0	0	0	2	1	1	0	1,05
	Accountability	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Integration	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

PROCESSES		Head of accountancy				Head of after sales service				Warehouse manager				Sales & Marketing				Project manager				Lower Mgmt
		P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4	
Design	Purpose	2	2	2	2	2	1	0	0					1	1	0	0	2	2	1	0	1,13
	Context	2	2	1	1	1	1	1	0					2	1	1	0	2	1	1	0	1,06
	Documentation	1	1	1	0	0	0	0	0	2	2	1	1	1	1	0	0	0	0	0	0	0,55
Performers	Knowledge	2	2	1	1	2	2	1	0	2	2	2	2	2	1	1	0	2	1	1	1	1,40
	Skills	1	1	1	1	1	1	1	0	2	2	1	1	1	1	0	0					0,94
	Behavior	2	2	1	1	2	2	2	1					2	1	1	1	2	2	2	1	1,56
Owner	Identity	2	2	2	2	2	1	1	1					2	1	0	0	2	0	0	0	1,13
	Activities	2	2	2	1	1	1	1	1	2	2	2	1	2	1	1	0	1	1	1	1	1,30
	Authority	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	2	1	1	1,15
Infrastructure	IT Systems	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HR Systems	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Metrics	Definition	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Uses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Step 2: Sort by value and make a boxplot of the assessment items

Lower Management	
Teamwork	1,88
Responsibility	1,63
Behavior	1,56
Knowledge	1,40
Customer Focus	1,35
Activities	1,30
Authority	1,15
Purpose	1,13
Identity	1,13
Context	1,06
Process Model	1,05
Skills	0,94
People	0,90
Attitude change	0,75
Documentation	0,55
Style	0,38



Descriptives

Min score: 0,38

Max score: 1,88

Mean: 1,13

Median: 1,13

≥ Q3:

Teamwork, Responsibility, Behaviour (Perform), Knowledge

≤ Q1:

People, Attitude toward change, Documentation, Style

1.3 Discrepancies

Step 1: Detect returning subcategories (=AIs) ≥ Q3 or ≤ Q1 for both groups

Lower Management	
Teamwork	1,88
Responsibility	1,63
Behavior	1,56
Knowledge	1,40
Customer Focus	1,35
Activities	1,30
Authority	1,15
Purpose	1,13
Identity	1,13
Context	1,06
Process Model	1,05
Skills	0,94
People	0,90
Attitude change	0,75
Documentation	0,55
Style	0,38

Upper Management	
Purpose	1,75
Style	1,50
Responsibility	1,50
Customer Focus	1,25
Context	1,25
Knowledge	1,25
Behavior	1,25
People	1,00
Authority	1,00
Attitude change	0,75
Skills	0,75
Identity	0,75
Teamwork	0,50
Process Model	0,50
Documentation	0,00
Activities	0,00

Lower Management:

≥ Q3: All scores ≥ 1,39

≤ Q1: All scores ≤ 0,91

Upper Management:

≥ Q3: All scores ≥ 1,25

≤ Q1: All scores ≤ 0,56

Returning categories:

≥ Q3:

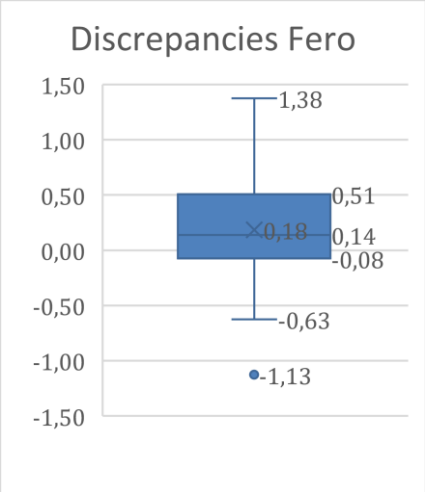
Responsibility, Knowledge, Behaviour (Perform)

≤ Q1:

Documentation

Step 2: Determine subcategories (=AIs) that differ the most between both groups

	Lower		Upper		Diff.
Teamwork	1,88	-	0,50	=	1,38
Activities	1,30	-	0,00	=	1,30
Process Model	1,05	-	0,50	=	0,55
Documentation	0,55	-	0,00	=	0,55
Identity	1,13	-	0,75	=	0,38
Behaviour	1,56	-	1,25	=	0,31
Skills	0,94	-	0,75	=	0,19
Authority	1,15	-	1,00	=	0,15
Responsibility	1,63	-	1,50	=	0,13
Customer Focus	1,31	-	1,25	=	0,06
Attitude change	0,75	-	0,75	=	0,00
Knowledge	1,25	-	1,25	=	0,00
People	0,90	-	1,00	=	-0,10
Context	1,06	-	1,25	=	-0,19
Purpose	1,13	-	1,75	=	-0,63
Style	0,38	-	1,50	=	-1,13



Higher scores Lower Management:

Documentation, Process Model, Activities, Teamwork

Higher scores Upper Management:

Style, Purpose, Context, People

2 Vossaert Kitchens-Interior

2.1 Upper Management

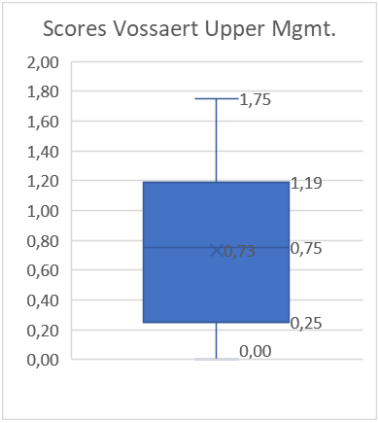
Step 1: Apply number key and calculate average score

ENTERPRISE		Manager 1				Manager 2				
		E1	E2	E3	E4	E1	E2	E3	E4	Upper mgmt
Leadership	Awareness	2	2	2	1	-	-	-	-	1,75
	Alignment	0	0	0	0	-	-	-	-	0,00
	Behavior	2	0	0	0	-	-	-	-	0,50
	Style	2	1	0	0	2	2	0	0	0,88
Culture	Teamwork	1	0	0	0	1	0	0	0	0,25
	Customer Focus	1	0	0	0	1	0	0	0	0,25
	Responsibility	2	2	0	0	1	1	0	0	0,75
	Attitude change	1	1	0	0	0	0	0	0	0,25
Expertise	People	1	0	0	0	2	1	1	0	0,63
	Methodology	x	x	x	x	x	x	x	x	x
Governance	Process Model	2	0	0	0	2	1	1	0	0,75
	Accountability	x	x	x	x	x	x	x	x	x
	Integration	x	x	x	x	x	x	x	x	x

PROCESSES		Manager 1				Manager 2				
		P1	P2	P3	P4	P1	P2	P3	P4	Upper mgmt
Design	Purpose	2	2	2	1	2	2	2	0	1,63
	Context	2	2	2	1	2	2	2	0	1,63
	Documentation	0	0	0	0	1	0	0	0	0,13
Performers	Knowledge	2	2	0	0	2	2	1	0	1,13
	Skills	2	1	0	0	1	1	1	0	0,75
	Behavior	2	1	0	0	2	1	0	0	0,75
Owner	Identity	2	2	2	2	0	0	0	0	1,00
	Activities	0	0	0	0	2	0	0	0	0,25
	Authority	2	2	2	0	2	1	1	1	1,38
Infrastructure	IT Systems	2	2	2	0	-	-	-	-	1,50
	HR Systems	x	x	x	x	x	x	x	x	x
Metrics	Definition	0	0	0	0	-	-	-	-	0,00
	Uses	0	0	0	0	-	-	-	-	0,00

Step 2: Sort by value and make a boxplot of the assessment items

Upper Management	
Awareness	1,75
Purpose	1,63
Context	1,63
IT Systems	1,50
Authority	1,38
Knowledge	1,13
Identity	1,00
Style	0,88
Responsibility	0,75
Process Model	0,75
Skills	0,75
Behavior (Perform)	0,75
People	0,63
Behavior (Leader)	0,50
Teamwork	0,25
Customer Focus	0,25
Attitude change	0,25
Activities	0,25
Documentation	0,13
Alignment	0,00
Definition	0,00
Uses	0,00



Descriptives

Min score: 0,00

Max score: 1,75

Mean: 0,73

Median: 0,75

≥ Q3:

Awareness, Purpose, Context, *IT systems*, Authority

≤ Q1:

Teamwork, Customer Focus, Attitude toward change, Activities, Documentation, Alignment, *Definition*, *Uses*

(In italic: Only assessed by upper mgmt.)

2.2 Lower Management

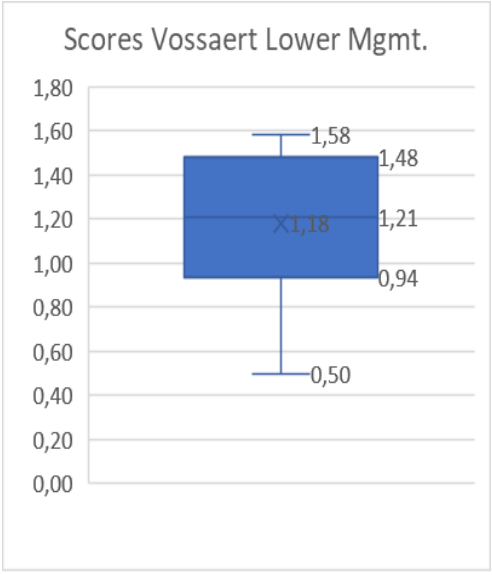
Step 1: Apply number key and calculate average score

ENTERPRISE		Calculator				Technical Designer 1				Technical Designer 2				Lower mgmt
		E1	E2	E3	E4	E1	E2	E3	E4	E1	E2	E3	E4	
Leadership	Awareness	-	-	-	-	-	-	-	-	-	-	-	-	-
	Alignment	-	-	-	-	-	-	-	-	-	-	-	-	-
	Behavior	-	-	-	-	-	-	-	-	-	-	-	-	-
	Style	1	1	1	0	0	0	0	0	1	1	1	0	0,50
Culture	Teamwork	2	1	1	1	1	1	0	0	1	0	0	0	0,67
	Customer Focus	2	2	2	2	2	2	1	1	2	1	1	1	1,58
	Responsibility	2	2	2	2	2	2	1	0	2	1	1	1	1,50
	Attitude change	2	2	1	0	1	1	0	0	1	1	1	1	0,92
Expertise	People	2	1	1	0	2	1	1	0	2	1	1	0	1,00
	Methodology	x	x	x	x	x	x	x	x	x	x	x	x	x
Governance	Process Model	1	1	1	1	2	2	2	1					1,38
	Accountability	x	x	x	x	x	x	x	x	x	x	x	x	x
	Integration	x	x	x	x	x	x	x	x	x	x	x	x	x

PROCESSES		Calculator				Technical Designer 1				Technical Designer 2				Lower mgmt
		P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4	
Design	Purpose	2	2	2	2	2	1	1	0	2	2	2	1	1,58
	Context	2	2	1	1	2	1	1	1	2	2	2	0	1,42
	Documentation	1	1	1	0	2	2	1	1	1	1	1	0	1,00
Performers	Knowledge	2	2	2	1	2	2	1	0	2	2	1	1	1,50
	Skills	2	2	1	1	2	1	0	0	2	1	1	1	1,17
	Behavior	2	2	2	2	2	1	1	0	2	1	1	1	1,42
Owner	Identity	1	1	1	1	2	2	1	1					1,25
	Activities	1	1	1	1	2	1	1	1					1,13
	Authority	1	1	1	1	1	1	1	0					0,88
Infrastructure	IT Systems	-	-	-	-	-	-	-	-	-	-	-	-	-
	HR Systems	x	x	x	x	x	x	x	x	x	x	x	x	x
Metrics	Definition	-	-	-	-	-	-	-	-	-	-	-	-	-
	Uses	-	-	-	-	-	-	-	-	-	-	-	-	-

Step 2: Sort by value and make a boxplot of the assessment items

Lower Management	
Customer Focus	1,58
Purpose	1,58
Responsibility	1,50
Knowledge	1,50
Context	1,42
Behavior	1,42
Process Model	1,38
Identity	1,25
Skills	1,17
Activities	1,13
People	1,00
Documentation	1,00
Attitude change	0,92
Authority	0,88
Teamwork	0,67
Style	0,50



Descriptives

Min score: 0,50

Max score: 1,58

Mean: 1,18

Median: 1,21

≥ Q3:

Customer Focus, Purpose, Responsibility, Knowledge

≤ Q1:

Attitude toward change, Authority, Teamwork, Style

2.3 Discrepancies

Step 1: Detect returning subcategories (=AIs) ≥ Q3 or ≤ Q1 for both groups

Lower Management	
Customer Focus	1,58
Purpose	1,58
Responsibility	1,50
Knowledge	1,50
Context	1,42
Behavior	1,42
Process Model	1,38
Identity	1,25
Skills	1,17
Activities	1,13
People	1,00
Documentation	1,00
Attitude change	0,92
Authority	0,88
Teamwork	0,67
Style	0,50

Upper Management	
Purpose	1,75
Context	1,63
Authority	1,38
Knowledge	1,13
Identity	1,00
Style	0,88
Responsibility	0,75
Process Model	0,75
Behavior	0,75
Skills	0,75
People	0,63
Customer Focus	0,25
Attitude change	0,25
Teamwork	0,25
Activities	0,25
Documentation	0,13

Lower Management:

≥ Q3: All scores ≥ 1,48

≤ Q1: All scores ≤ 0,94

Upper Management:

≥ Q3: All scores ≥ 1,09

≤ Q1: All scores ≤ 0,25

Returning categories:

≥ Q3:

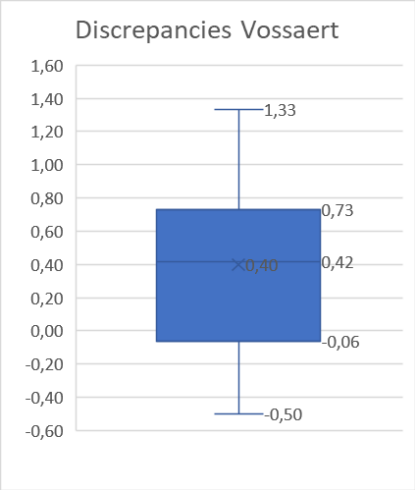
Purpose, Knowledge

≤ Q1:

Attitude toward change, Teamwork

Step 2: Determine subcategories (=AIs) that differ the most between both groups

	Lower		Upper		Diff.
Customer Focus	1,58	-	0,25	=	1,33
Activities	1,13	-	0,25	=	0,88
Documentation	1,00	-	0,13	=	0,88
Responsibility	1,50	-	0,75	=	0,75
Behaviour	1,42	-	0,75	=	0,67
Attitude change	0,92	-	0,25	=	0,67
Process Model	1,38	-	0,75	=	0,63
Skills	1,17	-	0,75	=	0,42
Teamwork	0,67	-	0,25	=	0,42
Knowledge	1,50	-	1,13	=	0,38
People	1,00	-	0,63	=	0,38
Identity	1,25	-	1,00	=	0,25
Purpose	1,58	-	1,75	=	-0,17
Context	1,42	-	1,63	=	-0,21
Style	0,50	-	0,88	=	-0,38
Authority	0,88	-	1,38	=	-0,50



Higher scores Lower Management:

Customer Focus, Activities, Documentation, Responsibility

Higher scores Upper Management:

Authority, Style, Context, Purpose

3 Maes Compressors

3.1 Upper Management

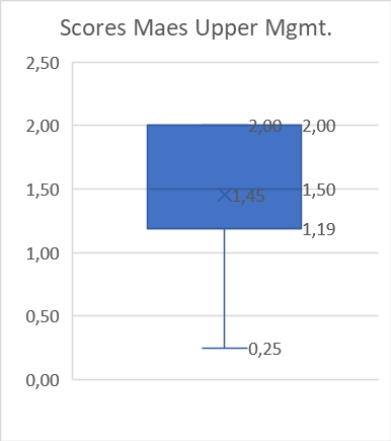
Step 1: Apply number key and calculate average score

ENTERPRISE		CEO E1	E2	E3	E4	Upper mgmt
Leadership	Awareness	2	2	2	2	2,00
	Alignment	2	2	2	1	1,75
	Behavior	2	2	2	2	2,00
	Style	2	2	2	2	2,00
Culture	Teamwork	2	2	2	2	2,00
	Customer Focus	2	2	2	2	2,00
	Responsibility	2	2	2	2	2,00
	Attitude change	1	0	0	0	0,25
Expertise	People	2	2	1	0	1,25
	Methodology	x	x	x	x	x
Governance	Process Model	2	2	1	0	1,25
	Accountability	x	x	x	x	x
	Integration	x	x	x	x	x

PROCESSES		CEO P1	P2	P3	P4	Upper mgmt
Design	Purpose	2	2	2	1	1,75
	Context	2	2	2	0	1,50
	Documentation	2	1	1	1	1,25
Performers	Knowledge	1	1	0	0	0,50
	Skills	2	2	0	0	1,00
	Behavior	2	2	2	1	1,75
Owner	Identity	2	2	0	0	1,00
	Activities	2	2	2	2	2,00
	Authority	2	2	2	0	1,50
Infrastructure	IT Systems	2	2	2	0	1,50
	HR Systems	x	x	x	x	x
Metrics	Definition	2	0	0	0	0,50
	Uses	2	1	1	1	1,25

Step 2: Sort by value and make a boxplot of the assessment items

Upper Management	
Awareness	2,00
Behavior (Leader)	2,00
Style	2,00
Teamwork	2,00
Customer Focus	2,00
Responsibility	2,00
Activities	2,00
Alignment	1,75
Purpose	1,75
Behavior (Perform)	1,75
Context	1,50
Authority	1,50
IT Systems	1,50
People	1,25
Process Model	1,25
Documentation	1,25
Uses	1,25
Skills	1,00
Identity	1,00
Knowledge	0,50
Definition	0,50
Attitude change	0,25



Descriptives

Min score: 0,25

Max score: 2,00

Mean: 1,45

Median: 1,50

≥ Q3:

Awareness, *Behaviour (Leader)*, Style, Teamwork, Customer Focus, Responsibility, Activities

≤ Q1:

Skills, Identity, Knowledge, *Definition*, Attitude toward change

(In italic: Only assessed by upper mgmt.)

3.2 Lower Management

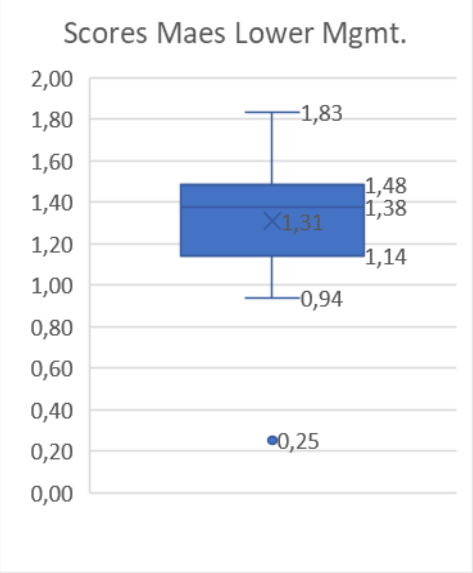
Step 1: Apply number key and calculate average score

ENTERPRISE		Representative of technicians				Head of projects				Warehouse responsible				Head of Service dept.				Lower mgmt
		E1	E2	E3	E4	E1	E2	E3	E4	E1	E2	E3	E4	E1	E2	E3	E4	
Leadership	Awareness	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Alignment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Behavior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Style	2	2	1	1	2	2	1	1	2	2	1	1	2	2	1	1	1,50
Culture	Teamwork	2	2	1	1	2	2	2	2					2	2	2	2	1,83
	Customer Focus	2	2	2	2	2	2	2	2	1	1	1	2	2	2	2	1	1,75
	Responsibility	2	1	1	1	2	2	1	1					2	2	1	1	1,42
	Attitude change	2	2	1	1	2	2	1	1	1	1	1	0	1	1	0	0	1,06
Expertise	People	1	1	1	1	2	2	2	0	2	2	2	1	2	2	2	0	1,44
	Methodology	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Governance	Process Model	2	1	0	0	1	1	0	0	2	2	2	2	2	1	1	1	1,13
	Accountability	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Integration	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

PROCESSES		Representative of technicians				Head of projects				Warehouse responsible				Head of Service Dept.				Lower mgmt
		P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4	
Design	Purpose	1	1	1	1	2	2	1	1	2	2	2	1	2	1	1	1	1,38
	Context	2	2	1	1	2	2	1	1	2	1	1	1	2	1	1	1	1,38
	Documentation	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0,25
Performers	Knowledge	2	2	2	1	2	2	2	2	1	1	1	0	1	1	1	0	1,31
	Skills	2	2	1	1	2	2	1	1	1	1	1	1	2	2	1	1	1,38
	Behavior	2	2	2	1	2	2	2	2	1	1	1	1	2	2	2	2	1,69
Owner	Identity	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0,94
	Activities	1	1	1	1	1	1	1	1	1	1	1	0	2	2	2	2	1,19
	Authority	2	1	1	1	2	2	1	0	1	1	1	1	2	2	2	1	1,31
Infrastructure	IT Systems	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HR Systems	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Metrics	Definition	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Uses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Step 2: Sort by value and make a boxplot of the assessment items

Lower Management	
Teamwork	1,83
Customer Focus	1,75
Behavior	1,69
Style	1,50
People	1,44
Responsibility	1,42
Context	1,38
Purpose	1,38
Skills	1,38
Authority	1,31
Knowledge	1,31
Activities	1,19
Process Model	1,13
Attitude change	1,06
Identity	0,94
Documentation	0,25



Descriptives

Min score: 0,25 (outlier)

Max score: 1,83

Mean: 1,31

Median: 1,38

≥ Q3:

Teamwork, Customer Focus, Behaviour (Perform), Style

≤ Q1:

Process Model, Attitude toward change, Identity, Documentation

3.3 Discrepancies

Step 1: Detect returning subcategories (=AIs) ≥ Q3 or ≤ Q1 for both groups

Lower Management	
Teamwork	1,83
Customer Focus	1,75
Behavior	1,69
Style	1,50
People	1,44
Responsibility	1,42
Context	1,38
Purpose	1,38
Skills	1,38
Authority	1,31
Knowledge	1,31
Activities	1,19
Process Model	1,13
Attitude change	1,06
Identity	0,94
Documentation	0,25

Upper Management	
Style	2,00
Teamwork	2,00
Customer Focus	2,00
Responsibility	2,00
Activities	2,00
Purpose	1,75
Behavior	1,75
Context	1,50
Authority	1,50
People	1,25
Process Model	1,25
Documentation	1,25
Skills	1,00
Identity	1,00
Knowledge	0,50
Attitude change	0,25

Lower Management:

≥ Q3: All scores ≥ 1,48

≤ Q1: All scores ≤ 1,14

Upper Management:

≥ Q3: All scores ≥ 2,00

≤ Q1: All scores ≤ 1,06

Returning categories:

≥ Q3:

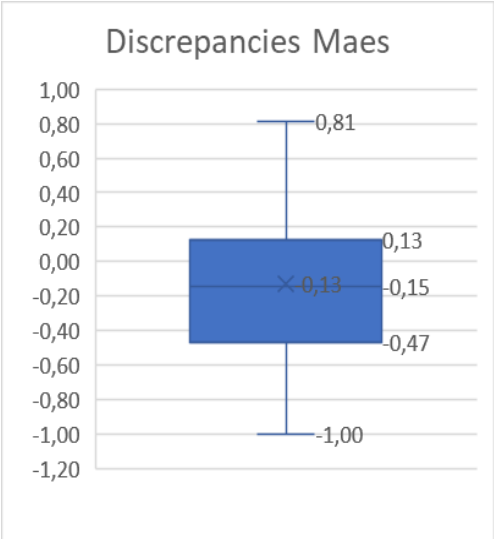
Teamwork, Customer Focus, Style

≤ Q1:

Attitude toward change, Identity

Step 2: Determine subcategories (AIs) that differ the most between both groups

	Lower		Upper		Diff.
Knowledge	1,31	-	0,50	=	0,81
Attitude change	1,06	-	0,25	=	0,81
Skills	1,38	-	1,00	=	0,38
People	1,44	-	1,25	=	0,19
Behaviour	1,69	-	1,75	=	-0,06
Identity	0,94	-	1,00	=	-0,06
Context	1,38	-	1,50	=	-0,13
Process Model	1,13	-	1,25	=	-0,13
Teamwork	1,83	-	2,00	=	-0,17
Authority	1,31	-	1,50	=	-0,19
Customer Focus	1,75	-	2,00	=	-0,25
Purpose	1,38	-	1,75	=	-0,38
Style	1,50	-	2,00	=	-0,50
Responsibility	1,42	-	2,00	=	-0,58
Activities	1,19	-	2,00	=	-0,81
Documentation	0,25	-	1,25	=	-1,00



Higher scores Lower Management:

Knowledge, Attitude toward change, Skills, People

Higher scores Upper Management:

Documentation, Activities, Responsibility, Style

4 Comparison

4.1. Subcategories (=AIs)

Step 1: Use three cases separately as a benchmark to detect patterns

Comparing the three cases is done using the data of the upper management, because they are assumed to be the people within the SMEs with the most high-level view of the company. This makes their data trustworthy to use as a benchmark for comparing the different case studies.

Benchmark Fero			
	Fero	Maes	Vossaert
Alignment	1,75	1,75	0,00
Awareness	1,75	2,00	1,75
Purpose	1,75	1,75	1,63
IT Systems	1,50	1,50	1,50
Responsibility	1,50	2,00	0,75
Style	1,50	2,00	0,88
Behaviour (Leader)	1,25	2,00	0,50
Behaviour (Perform)	1,25	1,75	0,75
Context	1,25	1,50	1,63
Customer Focus	1,25	2,00	0,25
Knowledge	1,25	0,50	1,13
Authority	1,00	1,50	1,38
People	1,00	1,25	0,63
Attitude change	0,75	0,25	0,25
Identity	0,75	1,00	1,00
Skills	0,75	1,00	0,75
Process Model	0,50	1,25	0,75
Teamwork	0,50	2,00	0,25
Definition	0,25	0,50	0,00
Uses	0,25	1,25	0,00
Activities	0,00	2,00	0,25
Documentation	0,00	1,25	0,13

Benchmark Vossaert			
	Vossaert	Maes	Fero
Awareness	1,75	2,00	1,75
Purpose	1,63	1,75	1,75
Context	1,63	1,50	1,25
IT Systems	1,50	1,50	1,50
Authority	1,38	1,50	1,00
Knowledge	1,13	0,50	1,25
Identity	1,00	1,00	0,75
Style	0,88	2,00	1,50
Responsibility	0,75	2,00	1,50
Behaviour (Perform)	0,75	1,75	1,25
Skills	0,75	1,00	0,75
Process Model	0,75	1,25	0,50
People	0,63	1,25	1,00
Behaviour (Leader)	0,50	2,00	1,25
Customer Focus	0,25	2,00	1,25
Attitude change	0,25	0,25	0,75
Teamwork	0,25	2,00	0,50
Activities	0,25	2,00	0,00
Documentation	0,13	1,25	0,00
Alignment	0,00	1,75	1,75
Definition	0,00	0,50	0,25
Uses	0,00	1,25	0,25

Benchmark Maes			
	Maes	Fero	Vossaert
Awareness	2,00	1,75	1,75
Responsibility	2,00	1,50	0,75
Style	2,00	1,50	0,88
Behaviour (Leader)	2,00	1,25	0,50
Customer Focus	2,00	1,25	0,25
Teamwork	2,00	0,50	0,25
Activities	2,00	0,00	0,25
Alignment	1,75	1,75	0,00
Purpose	1,75	1,75	1,63
Behaviour (Perform)	1,75	1,25	0,75
IT Systems	1,50	1,50	1,50
Context	1,50	1,25	1,63
Authority	1,50	1,00	1,38
People	1,25	1,00	0,63
Process Model	1,25	0,50	0,75
Uses	1,25	0,25	0,00
Documentation	1,25	0,00	0,13
Identity	1,00	0,75	1,00
Skills	1,00	0,75	0,75
Knowledge	0,50	1,25	1,13
Definition	0,50	0,25	0,00
Attitude change	0,25	0,75	0,25

Representing the data in this way allows the researchers to visually analyse how the scores on the different subcategories for the SMEs are positioned relatively to one another. The data is represented as it was in sections 1.1, 2.1 and 3.1 (step 2). The green cells indicate AIs ≥ Q3 for the individual companies, while the red cells stand for AIs ≤ Q1.

Step 2: Make a ranking for the three cases combined

Rankings	Fero	Maes	Vossaert	Sum Ranks	Average Rank
Awareness	1	1	1	3	**1**
Purpose	1	8	2	11	**2**
Style	4	1	8	13	**3**
Responsibility	4	1	9	14	**4**
IT Systems	4	11	4	19	**5**
Context	7	11	2	20	**6**
Behaviour (Leader)	7	1	14	22	**7**
Customer Focus	7	1	15	23	**8**
Behaviour (Perform)	7	8	9	24	**9**
Authority	12	11	5	28	**10**
Alignment	1	8	20	29	**11**
Knowledge	7	20	6	33	**12**
Teamwork	17	1	15	33	**12**
Activities	21	1	15	37	**14**
Identity	14	18	7	39	**15**
People	12	14	13	39	**15**
Process Model	17	14	9	40	**17**
Skills	14	18	9	41	**18**
Attitude change	14	22	15	51	**19**
Uses	19	14	20	53	**20**
Documentation	21	14	19	54	**21**
Definition	19	20	20	59	**22**

- Determine individual ranking of each subcategory per SME. Subcategories with the same score receive the same ranking.

- Add up individual rankings to calculate the sum of the ranks.

- Sort from low to high, representing the general ranking of the subcategories relative to each other.

Step 3: Situate the weighted subcategories (AIs) on the ranking of the individual companies

Most developed: **Infrastructure-IT systems, Leadership-Awareness, Leadership-Style, Design-Purpose, Design-Context and Culture-Responsibility**

Underdeveloped: Governance-Process model, Performers-Skills, Culture-Attitude toward change, Metrics-Uses, Design-Documentation and Metrics-Definition.

Fero	
Awareness	1,75
Alignment	1,75
Purpose	1,75
Style	1,50
Responsibility	1,50
IT Systems	1,50
Behaviour (Perform)	1,25
Customer Focus	1,25
Context	1,25
Knowledge	1,25
Behaviour (Leader)	1,25
People	1,00
Authority	1,00
Attitude change	0,75
Skills	0,75
Identity	0,75
Teamwork	0,50
Process Model	0,50
Definition	0,25
Uses	0,25
Documentation	0,00
Activities	0,00

Vossaert	
Awareness	1,75
Purpose	1,63
Context	1,63
IT Systems	1,50
Authority	1,38
Knowledge	1,13
Identity	1,00
Style	0,88
Responsibility	0,75
Process Model	0,75
Skills	0,75
Behaviour (Perform)	0,75
People	0,63
Behaviour (Leader)	0,50
Teamwork	0,25
Customer Focus	0,25
Attitude change	0,25
Activities	0,25
Documentation	0,13
Alignment	0,00
Definition	0,00
Uses	0,00

Maes	
Awareness	2,00
Behaviour (Leader)	2,00
Style	2,00
Teamwork	2,00
Customer Focus	2,00
Responsibility	2,00
Activities	2,00
Alignment	1,75
Purpose	1,75
Behaviour (Perform)	1,75
Context	1,50
Authority	1,50
IT Systems	1,50
People	1,25
Process Model	1,25
Documentation	1,25
Uses	1,25
Skills	1,00
Identity	1,00
Knowledge	0,50
Definition	0,50
Attitude change	0,25

4.2 Main categories

Step 1: Use three cases separately as a benchmark to detect patterns

The subcategories fall under a range of 9 main categories, which are depicted in the tables below. Again, this makes it possible to visually analyse how the scores on the different categories for the SMEs are positioned relatively to one another.

Benchmark Fero			
	Fero	Maes	Vossaert
Leadership	1,56	1,94	0,78
Infrastructure	1,50	1,50	1,50
Performers	1,08	1,08	0,88
Culture	1,00	1,56	0,38
Expertise	1,00	1,25	0,63
Design	1,00	1,50	1,17
Owner	0,58	1,50	0,88
Governance	0,50	1,25	0,75
Metrics	0,25	0,88	0,00

Benchmark Vossaert			
	Vossaert	Maes	Fero
Infrastructure	1,50	1,50	1,50
Design	1,17	1,50	1,00
Performers	0,88	1,08	1,08
Owner	0,88	1,50	0,58
Leadership	0,78	1,94	1,56
Governance	0,75	1,25	0,50
Expertise	0,63	1,25	1,00
Culture	0,38	1,56	1,00
Metrics	0,00	0,88	0,25

Benchmark Maes			
	Maes	Fero	Vossaert
Leadership	1,94	1,56	0,78
Culture	1,56	1,00	0,38
Design	1,50	1,00	1,17
Owner	1,50	0,58	0,88
Infrastructure	1,50	1,50	1,50
Expertise	1,25	1,00	0,63
Governance	1,25	0,50	0,75
Performers	1,08	1,08	0,88
Metrics	0,88	0,25	0,00

Step 2: Make a ranking for the three cases combined

Rankings	Fero	Maes	Vossaert	Sum Ranks	Average Rank
Infrastructure	2	3	1	6	**1**
Leadership	1	1	5	7	**2**
Design	4	3	2	9	**3**
Owner	7	3	3	13	**4**
Performers	3	8	3	14	**5**
Culture	4	2	8	14	**5**
Expertise	4	6	7	17	**7**
Governance	8	6	6	20	**8**
Metrics	9	9	9	27	**9**

The method used to compose an overall ranking for the categories is the same as in 4.1, step 2.

Step 3: Situate the weighted main categories on the ranking of the individual companies

Most developed: **Infrastructure**, **Leadership** and **Design**

Underdeveloped: Expertise, Governance and Metrics

Fero	
Leadership	1,56
Infrastructure	1,50
Performers	1,08
Culture	1,00
Expertise	1,00
Design	1,00
Owner	0,58
Governance	0,50
Metrics	0,25

Vossaert	
Infrastructure	1,50
Design	1,17
Performers	0,88
Owner	0,88
Leadership	0,78
Governance	0,75
Expertise	0,63
Culture	0,38
Metrics	0,00

Maes	
Leadership	1,94
Culture	1,56
Design	1,50
Owner	1,50
Infrastructure	1,50
Expertise	1,25
Governance	1,25
Performers	1,08
Metrics	0,88

Exhibit 4: Data analysis BPO McCormack

Structure model

- **Assessment items (AI):** 11 (= subcomponents)
- **Maturity scale:** 1-5 (five-point Likert scale, ranging from strongly disagree to strongly agree)
- **Maturity questionnaire:** per AI; question based on five-point Likert scale
- **Maturity calculation:** aggregating and averaging the scores = maturity stage
- **Maturity stages:** 5
    - Ad hoc (score ≤ 2)
    - Defined ($2 <$ score ≤ 3)
    - Linked ($3 <$ score ≤ 4)
    - Integrated (score ≥ 4)
- **BPM categories:** 3 (= BPO components)
    - Process View (PV)
    - Process Jobs (PJ)
    - Process Management & Measurement systems (PM)
- **BPO subcategories:** 11 (=BPO subcomponents): PV: 3, PJ: 3, PM:5

Finetuning Model

- All of the AIs in the model are preserved

Assessment Steps McCormack

Determine BPO per management (Upper and Lower)

1. Enlist the BPO maturity data
2. Calculate the BPO maturity for the upper management and lower management, by aggregating and averaging the assessment items over the respective managers

*For Upper and Lower Management**

1. Sort the assessment items by value (highest -> lowest) and make a boxplot of the AIs
    a. Determine descriptive statistics
        i. Minimum, Maximum, Mean, Median
        ii. Assessment items $\geq$ Q3 and $\leq$ Q1 on boxplot

*Discrepancies**

1. Detect returning assessment items that are $\geq$ Q3 or $\leq$ Q1 for both upper and lower management

2. Determine assessment items where scores given by upper and lower management differ the most by subtracting the scores and make a boxplot of the results
    a. Determine descriptive statistics

*Comparison main categories and subcategories (=AIs) **

1. Use three cases separately as a benchmark to detect patterns
2. Make a ranking for the three cases combines

*For the analysis of the AIs for the Upper and Lower Management, Discrepancies, and the Comparison, the following colour key will be used:

Colour Key AIs
PJ
PV
PM

1 Fero

1.1 Determine BPO maturity per management (Upper & Lower)

Step 1: Enlist the BPO maturity data

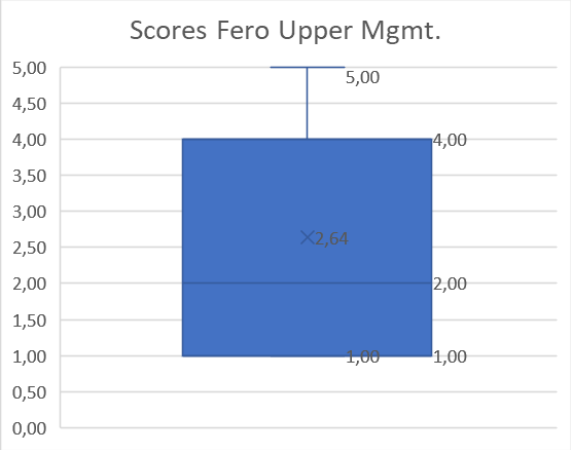
BPO Fero	CEO	COO	Head of accountancy	Head of after sales service	Warehouse manager	Sales & Marketing Manager	Project manager
Process View	3,33	3,33	4,00	3,67	4,00	3,00	3,33
1 The average employee views the business as a series of linked processes.	5,00	5,00	4,00	4,00	3,00	4,00	3,00
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00	1,00	4,00	3,00	4,00	2,00	3,00
3 The business processes are suffiently defined so that most employees know how they work.	4,00	4,00	4,00	4,00	5,00	3,00	4,00
Process Jobs	3,33	3,33	3,33	4,67	4,67	3,00	4,33
4 Jobs are usually multidimensional and not just simple tasks.	4,00	4,00	3,00	4,00	4,00	2,00	4,00
5 Jobs include frequent problem solving.	4,00	4,00	4,00	5,00	5,00	4,00	5,00
6 Employees are constantly learning new things on the job.	2,00	2,00	3,00	5,00	5,00	3,00	4,00
Process Management & Measurement Systems	1,80	1,80	3,80	1,80	3,20	3,00	2,40
7 Process performance is measured.	2,00	2,00	4,00	2,00	4,00	3,00	2,00
8 Process measurements are defined.	2,00	2,00	4,00	2,00	3,00	3,00	3,00
9 Resources are allocated based on process.	3,00	3,00	4,00	2,00	4,00	4,00	3,00
10 Specific process performance goals are in place.	1,00	1,00	3,00	1,00	2,00	2,00	2,00
11 Process outcomes are measured.	1,00	1,00	4,00	2,00	3,00	3,00	2,00
Total Score	2,82	2,82	3,71	3,38	3,96	3,00	3,36

Step 2: Calculate BPO maturity for Upper and Lower management

BPO Fero	Upper Mgmt.	Lower Mgmt.
Process View	3,33	3,60
1 The average employee views the business as a series of linked processes.	5,00	3,60
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00	3,20
3 The business processes are suffiently defined so that most employees know how they work.	4,00	4,00
Process Jobs	3,33	4,00
4 Jobs are usually multidimensional and not just simple tasks.	4,00	3,40
5 Jobs include frequent problem solving.	4,00	4,60
6 Employees are constantly learning new things on the job.	2,00	4,00
Process Management & Measurement Systems	1,80	2,84
7 Process performance is measured.	2,00	3,00
8 Process measurements are defined.	2,00	3,00
9 Resources are allocated based on process.	3,00	3,40
10 Specific process performance goals are in place.	1,00	2,00
11 Process outcomes are measured.	1,00	2,80
Total Score	2,82	3,48

1.2 Upper Management

	Upper Mgmt.
1 The average employee views the business as a series of linked processes.	5,00
3 The business processes are suffiently defined so that most employees know how they work.	4,00
4 Jobs are usually multidimensional and not just simple tasks.	4,00
5 Jobs include frequent problem solving.	4,00
9 Resources are allocated based on process.	3,00
6 Employees are constantly learning new things on the job.	2,00
7 Process performance is measured.	2,00
8 Process measurements are defined.	2,00
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00
10 Specific process performance goals are in place.	1,00
11 Process outcomes are measured.	1,00



Descriptives

Min score: 1,00

Max score: 5,00

Mean: 2,64

Median: 2,00

≥ Q3:

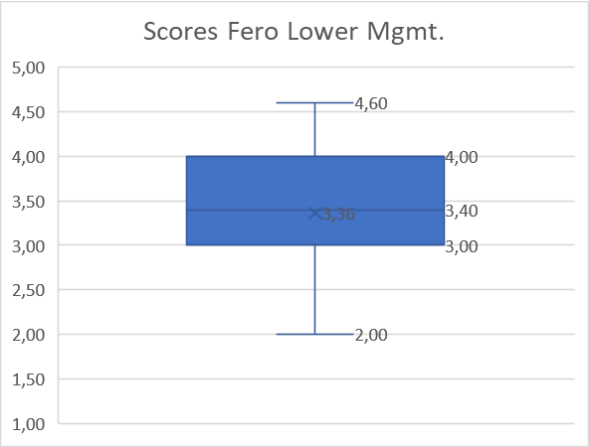
AI: 1, 3, 4 and 5

≤ Q1:

AI: 11, 10 and 2

1.3 Lower Management

	Lower Mgmt.
5 Jobs include frequent problem solving.	4,60
3 The business processes are suffiently defined so that most employees know how they work.	4,00
6 Employees are constantly learning new things on the job.	4,00
1 The average employee views the business as a series of linked processes.	3,60
4 Jobs are usually multidimensional and not just simple tasks.	3,40
9 Resources are allocated based on process.	3,40
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	3,20
7 Process performance is measured.	3,00
8 Process measurements are defined.	3,00
11 Process outcomes are measured.	2,80
10 Specific process performance goals are in place.	2,00



Descriptives

Min score: 2,00

Max score: 4,60

Mean: 3,36

Median: 3,40

≥ Q3:

AI: 5, 3 and 6

≤ Q1:

AI: 10, 11, 8 and 7

1.4 Discrepancies

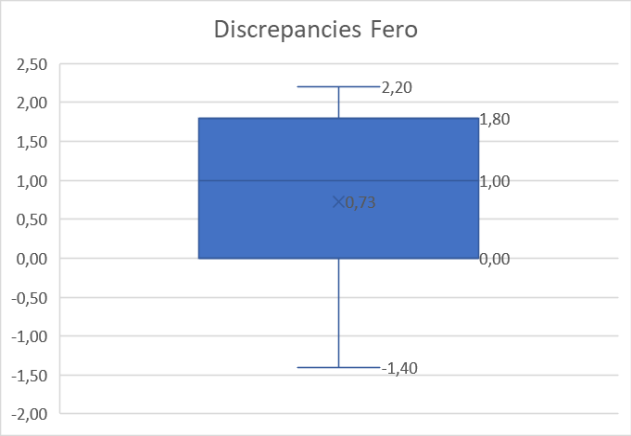
Step 1: Detect returning subcomponents (=AIs) ≥ Q3 or ≤ Q1 for both groups

≥ Q3: AI 3 and 5

≤ Q1: AI 10 and 11

Step 2: Determine subcomponents (=AIs) that differ the most between both groups

		Lower Mgmt.		Upper Mgmt.		Diff.
2	Process terms such as input, output, process and process owners are used in conversation in the organisation.	3,20	-	1,00	=	2,20
6	Employees are constantly learning new things on the job.	4,00	-	2,00	=	2,00
11	Process outcomes are measured.	2,80	-	1,00	=	1,80
7	Process performance is measured.	3,00	-	2,00	=	1,00
8	Process measurements are defined.	3,00	-	2,00	=	1,00
10	Specific process performance goals are in place.	2,00	-	1,00	=	1,00
5	Jobs include frequent problem solving.	4,60	-	4,00	=	0,60
9	Resources are allocated based on process.	3,40	-	3,00	=	0,40
3	The business processes are suffiently defined so that most employees know how they work.	4,00	-	4,00	=	0,00
4	Jobs are usually multidimensional and not just simple tasks.	3,40	-	4,00	=	-0,60
1	The average employee views the business as a series of linked processes.	3,60	-	5,00	=	-1,40



Higher Scores Lower Management:

AI: 2, 6 and 11

Higher Scores Upper Management:

AI: 1 and 4

2 Vossaert Kitchens-Interior

2.1 Determine BPO maturity per management (Upper & Lower)

Step 1: Enlist the BPO maturity data

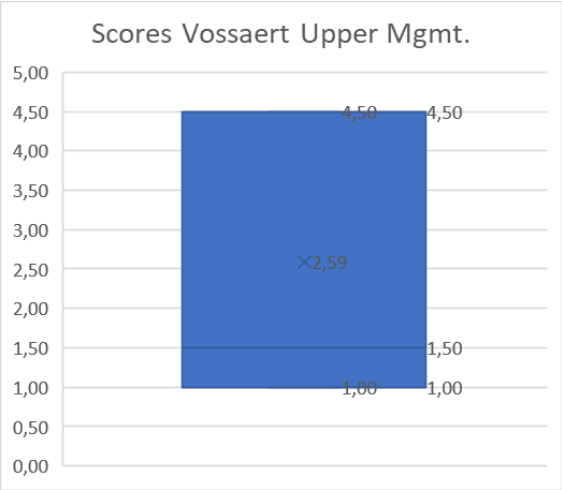
BPO Vossaert	Manager 1	Manager 2	Calculator	Technical Designer 1	Technical Designer 2
Process View	**3,00**	**3,67**	**3,00**	**3,33**	**3,33**
1 The average employee views the business as a series of linked processes.	4,00	5,00	4,00	5,00	4,00
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00	1,00	2,00	1,00	2,00
3 The business processes are suffiently defined so that most employees know how they work.	4,00	5,00	3,00	4,00	4,00
Process Jobs	**3,67**	**4,33**	**2,67**	**4,00**	**2,33**
4 Jobs are usually multidimensional and not just simple tasks.	4,00	5,00	3,00	5,00	2,00
5 Jobs include frequent problem solving.	3,00	4,00	3,00	5,00	3,00
6 Employees are constantly learning new things on the job.	4,00	4,00	2,00	2,00	2,00
Process Management & Measurement Systems	**1,40**	**1,20**	**2,25**	**1,80**	**2,00**
7 Process performance is measured.	1,00	2,00	3,00	2,00	3,00
8 Process measurements are defined.	1,00	1,00	2,00	1,00	2,00
9 Resources are allocated based on process.	2,00	1,00		3,00	
10 Specific process performance goals are in place.	1,00	1,00	2,00	1,00	1,00
11 Process outcomes are measured.	2,00	1,00	2,00	2,00	2,00
Total Score	**2,69**	**3,07**	**2,64**	**3,04**	**2,56**

Step 2: Calculate BPO maturity for Upper and Lower management

BPO Vossaert	Upper Mgmt.	Lower Mgmt.
Process View	**3,33**	**3,22**
1 The average employee views the business as a series of linked processes.	4,50	4,33
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00	1,67
3 The business processes are suffiently defined so that most employees know how they work.	4,50	3,67
Process Jobs	**4,00**	**3,00**
4 Jobs are usually multidimensional and not just simple tasks.	4,50	3,33
5 Jobs include frequent problem solving.	3,50	3,67
6 Employees are constantly learning new things on the job.	4,00	2,00
Process Management & Measurement Systems	**1,30**	**2,13**
7 Process performance is measured.	1,50	2,67
8 Process measurements are defined.	1,00	1,67
9 Resources are allocated based on process.	1,50	3,00
10 Specific process performance goals are in place.	1,00	1,33
11 Process outcomes are measured.	1,50	2,00
Total Score	**2,88**	**2,79**

2.2 Upper Management

		Upper Mgmt.
1	The average employee views the business as a series of linked processes.	4,50
3	The business processes are suffiently defined so that most employees know how they work.	4,50
4	Jobs are usually multidimensional and not just simple tasks.	4,50
6	Employees are constantly learning new things on the job.	4,00
5	Jobs include frequent problem solving.	3,50
7	Process performance is measured.	1,50
9	Resources are allocated based on process.	1,50
11	Process outcomes are measured.	1,50
2	Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00
8	Process measurements are defined.	1,00
10	Specific process performance goals are in place.	1,00



Descriptives

Min score: 1,00

Max score: 4,50

Mean: 2,59

Median: 1,50

≥ Q3:

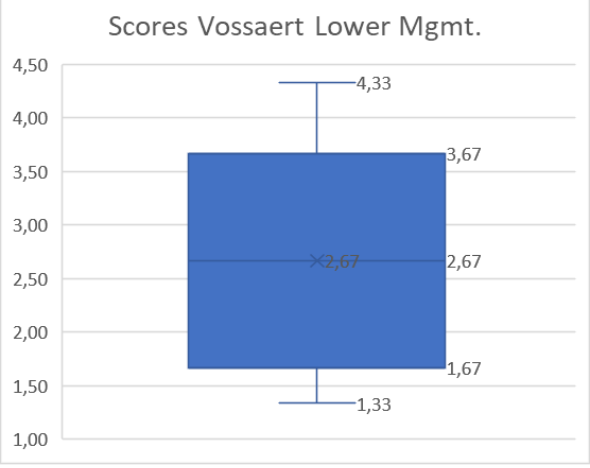
AI: 1, 3 and 4

≤ Q1:

AI: 10, 8 and 2

2.3 Lower Management

		Lower Mgmt.
1	The average employee views the business as a series of linked processes.	4,33
5	Jobs include frequent problem solving.	3,67
3	The business processes are suffiently defined so that most employees know how they work.	3,67
4	Jobs are usually multidimensional and not just simple tasks.	3,33
9	Resources are allocated based on process.	3,00
7	Process performance is measured.	2,67
6	Employees are constantly learning new things on the job.	2,00
11	Process outcomes are measured.	2,00
8	Process measurements are defined.	1,67
2	Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,67
10	Specific process performance goals are in place.	1,33



Descriptives

Min score: 1,33

Max score: 4,33

Mean: 2,67

Median: 2,67

≥ Q3:

AI: 1, 5 and 3

≤ Q1:

AI: 10, 2 and 8

2.4 Discrepancies

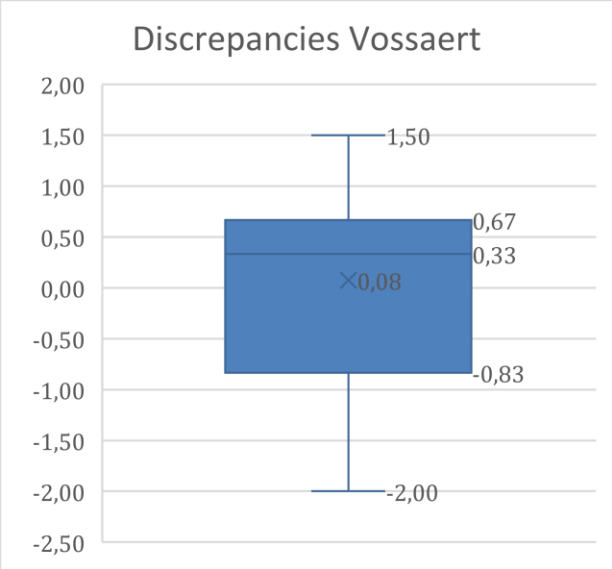
Step 1: Detect returning subcomponents (AIs) ≥ Q3 or ≤ Q1 for both groups

≥ Q3: AI 1 and 3

≤ Q1: AI 2, 8 and 10

Step 2: Determine subcomponents (AIs) that differ the most between both groups

	Lower Mgmt.		Upper Mgmt.		Diff.
9 Resources are allocated based on process.	3,00	-	1,50	=	1,50
7 Process performance is measured.	2,67	-	1,50	=	1,17
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,67	-	1,00	=	0,67
8 Process measurements are defined.	1,67	-	1,00	=	0,67
11 Process outcomes are measured.	2,00	-	1,50	=	0,50
10 Specific process performance goals are in place.	1,33	-	1,00	=	0,33
5 Jobs include frequent problem solving.	3,67	-	3,50	=	0,17
1 The average employee views the business as a series of linked processes.	4,33	-	4,50	=	-0,17
3 The business processes are suffiently defined so that most employees know how they work.	3,67	-	4,50	=	-0,83
4 Jobs are usually multidimensional and not just simple tasks.	3,33	-	4,50	=	-1,17
6 Employees are constantly learning new things on the job.	2,00	-	4,00	=	-2,00



Higher Scores Lower Management:

AI: 9, 7, 2 and 8

Higher Scores Upper Management:

AI: 6, 4 and 3

3 Maes

3.1 Determine BPO maturity per management (Upper & Lower)

Step 1: Enlist the BPO maturity data

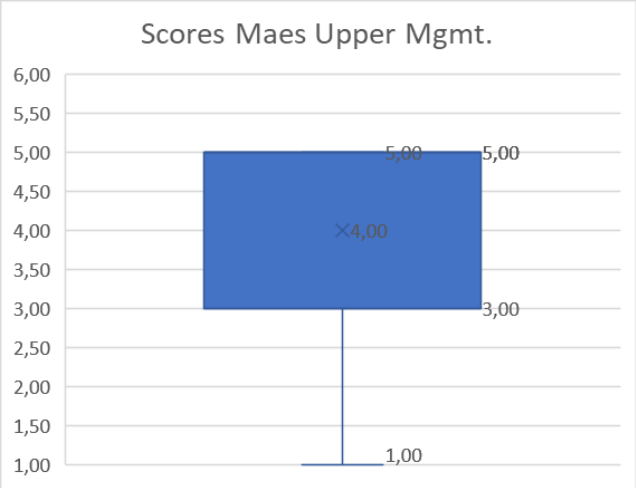
BPO Maes	CEO	Representative of technicians	Head of projects and installations	Warehouse Responsible	Head of Service Dept.
Process View	**3,33**	**3,67**	**3,33**	**2,00**	**2,67**
1 The average employee views the business as a series of linked processes.	4,00	4,00	4,00	2,00	3,00
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00	3,00	2,00	2,00	2,00
3 The business processes are suffiently defined so that most employees know how they work.	5,00	4,00	4,00	2,00	3,00
Process Jobs	**4,33**	**5,00**	**4,67**	**3,67**	**4,33**
4 Jobs are usually multidimensional and not just simple tasks.	5,00	5,00	5,00	4,00	5,00
5 Jobs include frequent problem solving.	5,00	5,00	5,00	4,00	4,00
6 Employees are constantly learning new things on the job.	3,00	5,00	4,00	3,00	4,00
Process Management & Measurement Systems	**4,20**	**3,33**	**4,00**	**3,50**	**3,40**
7 Process performance is measured.	5,00			3,00	2,00
8 Process measurements are defined.	5,00				4,00
9 Resources are allocated based on process.	5,00	4,00	4,00	4,00	4,00
10 Specific process performance goals are in place.	1,00	2,00			3,00
11 Process outcomes are measured.	5,00	4,00			4,00
Total Score	**3,96**	**4,00**	**4,00**	**3,06**	**3,47**

Step 2: Calculate BPO maturity for Upper and Lower management

BPO Maes	Upper Mgmt.	Lower Mgmt.
Process View	**3,33**	**2,92**
1 The average employee views the business as a series of linked processes.	4,00	3,25
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00	2,25
3 The business processes are suffiently defined so that most employees know how they work.	5,00	3,25
Process Jobs	**4,33**	**4,42**
4 Jobs are usually multidimensional and not just simple tasks.	5,00	4,75
5 Jobs include frequent problem solving.	5,00	4,50
6 Employees are constantly learning new things on the job.	3,00	4,00
Process Management & Measurement Systems	**4,20**	**3,40**
7 Process performance is measured.	5,00	2,50
8 Process measurements are defined.	5,00	4,00
9 Resources are allocated based on process.	5,00	4,00
10 Specific process performance goals are in place.	1,00	2,50
11 Process outcomes are measured.	5,00	4,00
Total Score	**3,96**	**3,58**

3.2 Upper Management

		Upper Mgmt.
3	The business processes are suffiently defined so that most employees know how they work.	5,00
4	Jobs are usually multidimensional and not just simple tasks.	5,00
5	Jobs include frequent problem solving.	5,00
7	Process performance is measured.	5,00
8	Process measurements are defined.	5,00
9	Resources are allocated based on process.	5,00
11	Process outcomes are measured.	5,00
1	The average employee views the business as a series of linked processes.	4,00
6	Employees are constantly learning new things on the job.	3,00
2	Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00
10	Specific process performance goals are in place.	1,00



Descriptives

Min score: 1,00

Max score: 5,00

Mean: 4,00

Median: 5,00

≥ Q3:

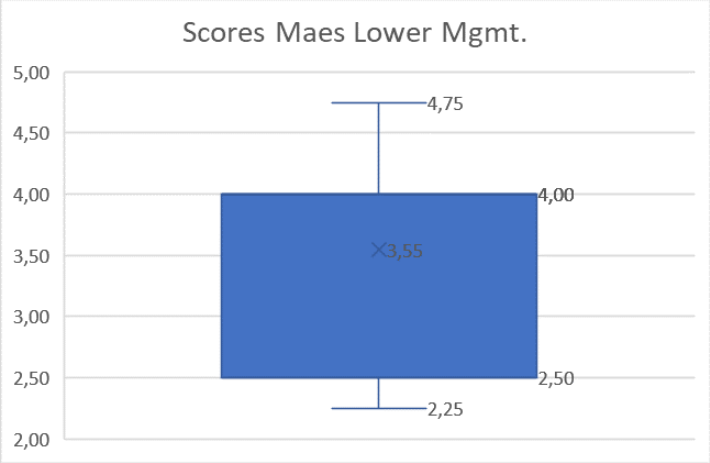
AI: 3, 4, 5, 7; 8, 9 and 11

≤ Q1:

AI: 10, 2 and 6

3.3 Lower Management

		Lower Mgmt.
4	Jobs are usually multidimensional and not just simple tasks.	4,75
5	Jobs include frequent problem solving.	4,50
6	Employees are constantly learning new things on the job.	4,00
8	Process measurements are defined.	4,00
9	Resources are allocated based on process.	4,00
11	Process outcomes are measured.	4,00
1	The average employee views the business as a series of linked processes.	3,25
3	The business processes are suffiently defined so that most employees know how they work.	3,25
7	Process performance is measured.	2,50
10	Specific process performance goals are in place.	2,50
2	Process terms such as input, output, process and process owners are used in conversation in the organisation.	2,25



Descriptives

Min score: 2,25

Max score: 4,75

Mean: 3,55

Median: 4,00

≥ Q3:

AI: 4, 5, 6, 8, 9 and 11

≤ Q1:

AI: 2, 10 and 7

3.4 Discrepancies

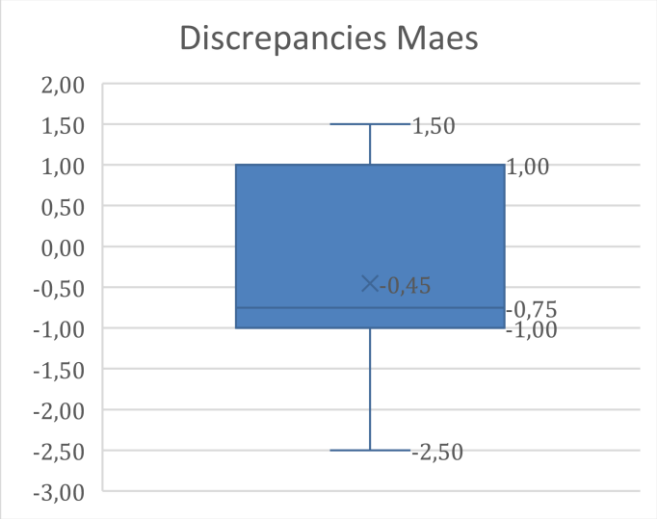
Step 1: Detect returning subcomponents (AIs) ≥ Q3 or ≤ Q1 for both groups

≥ Q3: AI 4, 5, 8, 9 and 11

≤ Q1: AI 2 and 10

Step 2: Determine subcomponents (AIs) that differ the most between both groups

		Lower Mgmt.		Upper Mgmt.		Diff.
10	Specific process performance goals are in place.	2,50	-	1,00	=	1,50
2	Process terms such as input, output, process and process owners are used in conversation in the organisation.	2,25	-	1,00	=	1,25
6	Employees are constantly learning new things on the job.	4,00	-	3,00	=	1,00
4	Jobs are usually multidimensional and not just simple tasks.	4,75	-	5,00	=	-0,25
5	Jobs include frequent problem solving.	4,50	-	5,00	=	-0,50
1	The average employee views the business as a series of linked processes.	3,25	-	4,00	=	-0,75
8	Process measurements are defined.	4,00	-	5,00	=	-1,00
9	Resources are allocated based on process.	4,00	-	5,00	=	-1,00
11	Process outcomes are measured.	4,00	-	5,00	=	-1,00
3	The business processes are suffiently defined so that most employees know how they work.	3,25	-	5,00	=	-1,75
7	Process performance is measured.	2,50	-	5,00	=	-2,50



Higher Scores Lower Management:

AI: 10, 2 and 6

Higher Scores Upper Management:

AI: 7, 3, 11, 9 and 8

4 Comparison

Step 1: Use three cases separately as a benchmark to detect patterns

Again, the data of the upper management is used to compare the three SMEs (cf. supra).

For each SME, the AIs (=subcomponents) are ranked from highest to lowest and compared with the AI of the other two enterprises. Based on these benchmarks, one can identify patterns and one can tell how the assessment items are positioned relatively to one another for the different cases. Green cells indicate AIs ≥ Q3 for the individual enterprises, while red cells indicate AIs ≤ Q1.

Fero Benchmark BPO Subcomponents			
	Fero	**Vossaert**	**Maes**
1 The average employee views the business as a series of linked processes.	5,00	4,50	4,00
3 The business processes are suffiently defined so that most employees know how they work.	4,00	4,50	5,00
4 Jobs are usually multidimensional and not just simple tasks.	4,00	4,50	5,00
5 Jobs include frequent problem solving.	4,00	3,50	5,00
9 Resources are allocated based on process.	3,00	1,50	5,00
6 Employees are constantly learning new things on the job.	2,00	4,00	3,00
7 Process performance is measured.	2,00	1,50	5,00
8 Process measurements are defined.	2,00	1,00	5,00
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00	1,00	1,00
10 Specific process performance goals are in place.	1,00	1,00	1,00
11 Process outcomes are measured.	1,00	1,50	5,00

Vossaert Benchmark BPO Subcomponents			
	Vossaert	**Maes**	**Fero**
1 The average employee views the business as a series of linked processes.	4,50	4,00	5,00
3 The business processes are suffiently defined so that most employees know how they work.	4,50	5,00	4,00
4 Jobs are usually multidimensional and not just simple tasks.	4,50	5,00	4,00
6 Employees are constantly learning new things on the job.	4,00	3,00	2,00
5 Jobs include frequent problem solving.	3,50	5,00	4,00
7 Process performance is measured.	1,50	5,00	2,00
9 Resources are allocated based on process.	1,50	5,00	3,00
11 Process outcomes are measured.	1,50	5,00	1,00
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00	1,00	1,00
8 Process measurements are defined.	1,00	5,00	2,00
10 Specific process performance goals are in place.	1,00	1,00	1,00

Maes Benchmark BPO Subcomponents			
	Maes	**Fero**	**Vossaert**
3 The business processes are suffiently defined so that most employees know how they work.	5,00	4,00	4,50
4 Jobs are usually multidimensional and not just simple tasks.	5,00	4,00	4,50
5 Jobs include frequent problem solving.	5,00	4,00	3,50
7 Process performance is measured.	5,00	2,00	1,50
8 Process measurements are defined.	5,00	2,00	1,00
9 Resources are allocated based on process.	5,00	3,00	1,50
11 Process outcomes are measured.	5,00	1,00	1,50
1 The average employee views the business as a series of linked processes.	4,00	5,00	4,50
6 Employees are constantly learning new things on the job.	3,00	2,00	4,00
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00	1,00	1,00
10 Specific process performance goals are in place.	1,00	1,00	1,00

Step 2: Make a ranking for the three cases combined

A general ranking over the three enterprises is made based on the average scores of the BPO components. Once again, the distinction is made between the main components and the subcomponents.

At the **main component level** (table 'BPO components'), the average BPO maturity based on upper management for the three SMEs combined is the highest for PJ, and the lowest for PM. Fero and Vossaert exhibit the same ranking for the main BPO components: PJ ≥ PV ≥ PM. For Maes however, PM is assessed higher than PV. Fero has the lowest BPO level with an average of 2,82 (Defined), Vossaert's BPO is slightly better with a score of 2,88 (Defined), and Maes has the highest BPO level with a score of 3,96 (Linked) out of 5. When the BPO level assessed by the upper management is

compared with the one of the lower management, Fero's lower management clearly provides a higher BPO score (3,48 vs. 2,82). For Vossaert, the lower management has approximately the same score as the upper management (2,79 vs. 2,88), while Maes' lower management is convinced that the BPO level is less than the one postulated by the upper management (3,58 vs. 3,96). The average BPO maturity according to the lower management for the three SMEs combined exhibits the same pattern as the upper management: PJ ≥ PV ≥ PM.

BPO Components	Upper management					Lower Management				
	Fero	Vossaert	Maes	Avg. Score	Rank	Fero	Vossaert	Maes	Avg. Score	Rank
PJ	3,33	4,00	4,33	3,89	1	4,00	3,00	4,42	3,81	1
PV	3,33	3,33	3,33	3,33	2	3,60	3,22	2,92	3,25	2
PM	1,80	1,30	4,20	2,43	3	2,84	2,13	3,40	2,79	3
BPO Score	**2,82**	**2,88**	**3,96**			**3,48**	**2,79**	**3,58**		

At the **subcomponent level** (table 'BPO subcomponents'), the top scoring subcomponents (i.e. AIs ≥ Q3) are: *The average employee views the business as a series of linked processes* (AI 1), *The business processes are sufficiently defined so that most employees know how they work* (AI 3), and *Jobs are usually multidimensional and not just simple tasks* (AI 4). These three AIs have an average score of 4,5 out of 5 across the three SMEs. The three AIs with the lowest scores across the SMEs (i.e. AIs ≤ Quartile 1) are: *Process outcomes are measured* (AI 11), *Process terms such as input, output, process and process owners are used in conversation in the organisation* (AI 2), and *Specific process performance goals are in place* (AI 10). One can tell that the PJ subcomponents score the highest, while the PM subcomponents have a low average score. Two of the three PV subcomponents have the highest scores of all the subcomponents, but the PV average decreases a lot, because PV also delivers the second to last subcomponent in terms of average score over the three SMEs: *Process terms such as input, output, process and process owner are used in conversation in the organisation* (AI 2).

BPO Subcomponents	Fero	Vossaert	Maes	Avg. Score	Rank
1 The average employee views the business as a series of linked processes.	5,00	4,50	4,00	4,50	1
3 The business processes are suffiently defined so that most employees know how they work.	4,00	4,50	5,00	4,50	1
4 Jobs are usually multidimensional and not just simple tasks.	4,00	4,50	5,00	4,50	1
5 Jobs include frequent problem solving.	4,00	3,50	5,00	4,17	4
9 Resources are allocated based on process.	3,00	1,50	5,00	3,17	5
6 Employees are constantly learning new things on the job.	2,00	4,00	3,00	3,00	6
7 Process performance is measured.	2,00	1,50	5,00	2,83	7
8 Process measurements are defined.	2,00	1,00	5,00	2,67	8
11 Process outcomes are measured.	1,00	1,50	5,00	2,50	9
2 Process terms such as input, output, process and process owners are used in conversation in the organisation.	1,00	1,00	1,00	1,00	10
10 Specific process performance goals are in place.	1,00	1,00	1,00	1,00	10

The rankings of the AIs for the individual companies do not deviate much from the general average ranking, as can be visually derived from the table 'BPO subcomponents'. Green cells indicate AIs ≥ Q3 both for the individual enterprises and the average score across the three SMEs, while red cells indicate AIs ≤ Q1. Green cells are grouped together towards the top, while the red cells are found at the bottom.

Exhibit 5: Enterprise Architectures of order fulfilment process

1 Fero

Business Layer

Roles & Actors

External parties to the company and the people/business roles that come into contact with those parties.

Business Actor: Clients (Distributors: B2B). Fero is a wholesale company that acts as an intermediary by importing stoves and fireplaces distributing them to local distributors.

Business Role: Sales Fero**.** Within Fero, there are five representatives responsible for the sales of the products to the clients. They are linked with the clients through an association link.

Business Collaboration: Fero Service. For the after-sale service, Fero puts in place a separate entity. When there are problems for the client, they will take the task upon them to solve this. Examples of these problems are: damage, wrong delivery, training, etc.

External Business Services

In this section, the external business services are defined. The question here is: 'What does Fero do from a client's perspective?'

Wholesale of stoves & fireplaces: Sales people present the assortment of different stoves and fireplaces to the clients. It is important for Fero to keep up with the newest trends and technologies.

Training**:** Fero (Service) provides training for their distributors. Fero Service provides technical training, whereas Fero focuses on commercial training.

Technical Assistance: When the client experiences issues, they can reach out to Fero Service, who will then take care of the problem.

Business Processes and internal actors/roles

Next up is the final subcategory of the business layer. Fero has one main business process for the end-to-end treatment of their products, the order fulfilment process. It is modelled as one streamlined process, yet it can be subdivided in three sub-processes.

First up, there is the procure-to-pay process. A business actor, the purchase responsible, decides when a certain product must be purchased. This can be a complete stove or parts. Within Fero, this is done by one person who makes this decision partially on intuition. This person knows the market extremely well and is able to estimate which models might boom in sales and which ones might decline. Applying statistics to this proves to be very difficult. Next, the purchased products are received, put into storage and the payment is made.

Following this, there is an order-to-cash process. When a client submits an order to purchase a product, this order is processed by the logistics department, picked out of storage by a warehouse manager and transported. The transportation is outsourced 90% of the time as this is not the core business of Fero.

A final process is issue-to-resolution. When there are issues, such as damage upon arrival, the client can contact the after-sale service department, Fero Service, who will take care of it.

Application Layer

What applications are used within the company to support these internal/external business services?

Interface Spreadsheet: The purchasing of new products is being done manually through an excel spreadsheet. Some models only have a sale of four to five per year. Applying statistics to these figures is not relevant. The purchasing decisions need intuition and a thorough market understanding. Fero believes that automating the purchase order is not a desirable strategy, as this could lead to stock issues.

Inventory management & Order to shipment: The order-to-cash process is entirely supported by an ERP package, namely Exact. The program keeps track of inventory levels, orders, financials, etc.

This ERP package has a wide range of functions. We defined the three most important ones for Fero.

-Analysis & Advice**:** Gathering all information in one place and the possibility to analyse the data.

-Support**:** Exact continually optimises their application. They aim to provide an easy-to-use application.

-Optimalisation**:** Exact provides training for users as well. This training is provided online, on the company or at an external location. In this way, they encourage the users to get the best out of the application.

Intervention module Fero: For the after sales service, Fero developed an application themselves in collaboration with an IT partner. Clients can contact Fero through different communication channels.

Technology Layer

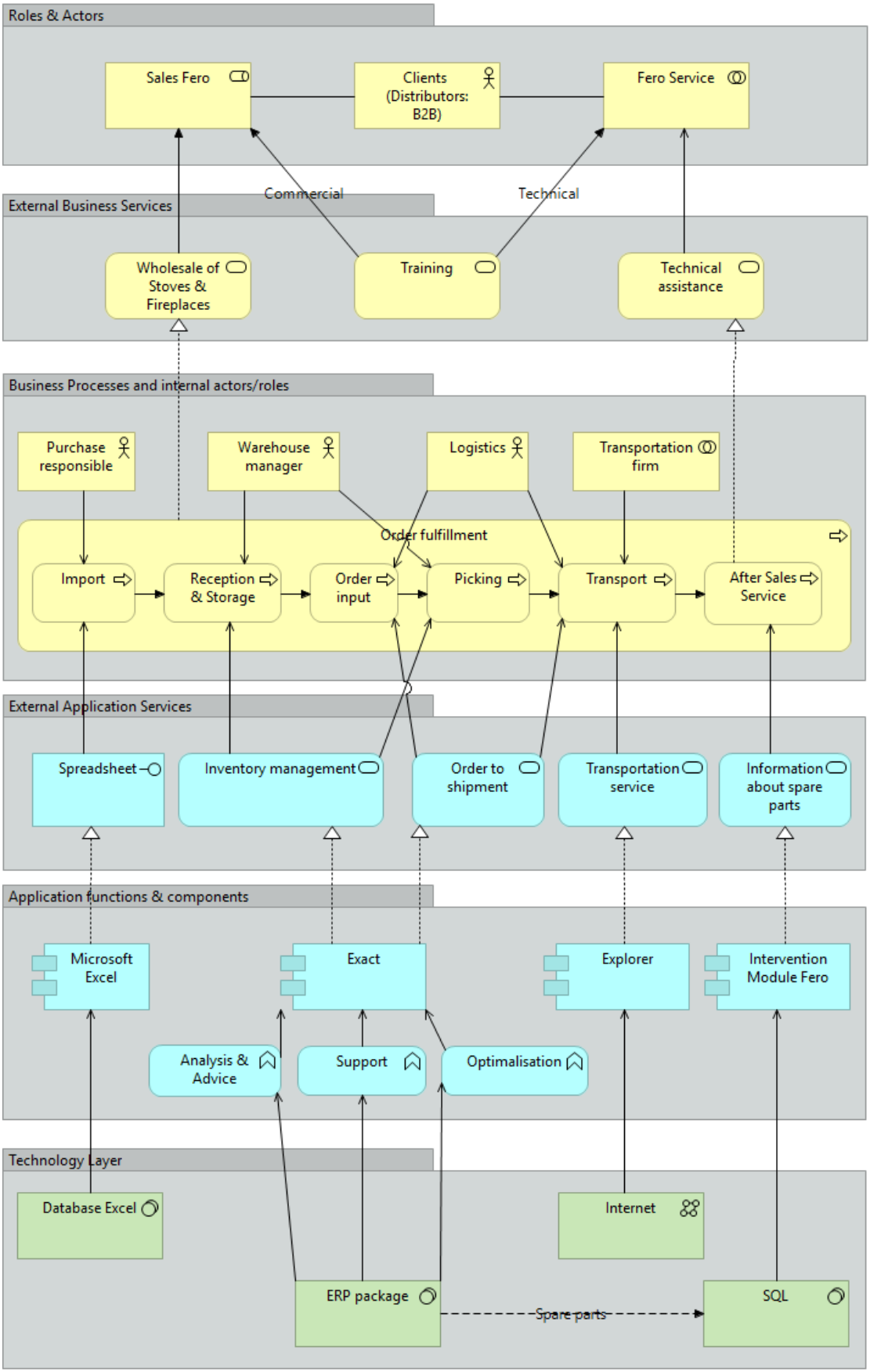
Finally, this can be linked to the technologies underlying the different applications.

Database: The Excel application is linked with a database.

ERP package: The functions of Exact are supported by the system software of the ERP package.

SQL: The intervention module application is linked with an SQL database. This SQL database can retrieve data from the ERP package. This data transfer only works in one direction.

Internet: Internet is indispensable in an organisation; almost all information is transferred through this medium. From contacting transportation companies to updating the database, all is done through the internet.



EA Order Fulfilment Process Fero

2 Vossaert Kitchens-Interior

Business Layer

Roles & Actors

Clients (B2B & B2C): Vossaert Kitchens-Interior takes pride in the design of customised solutions for their clients. These clients are private individuals as well as well as businesses.

Designers: The designer team consisting of four employees has the first contact with the client. They listen to the needs of the customer and get to work.

Representative: When a client has decided to ask for a design from Vossaert, a representative is assigned to this customer, who handles further communications.

Installer: At the end of the cycle, the installers install the customised furniture for the client.

External Business Services

Custom made design: As mentioned in the actor's section, a design is made for the client. When the customer is not pleased with the result, there are two options. First, it can be decided to discontinue the collaboration. The second option is to alter the design after receiving feedback and starting over.

Handle file: The representative handles the physical file throughout the whole business cycle.

Installation: The installers go to the client and perform the installation.

Business Processes and internal actors/roles

Vossaert has one main end-to-end business process, namely the order fulfilment process.

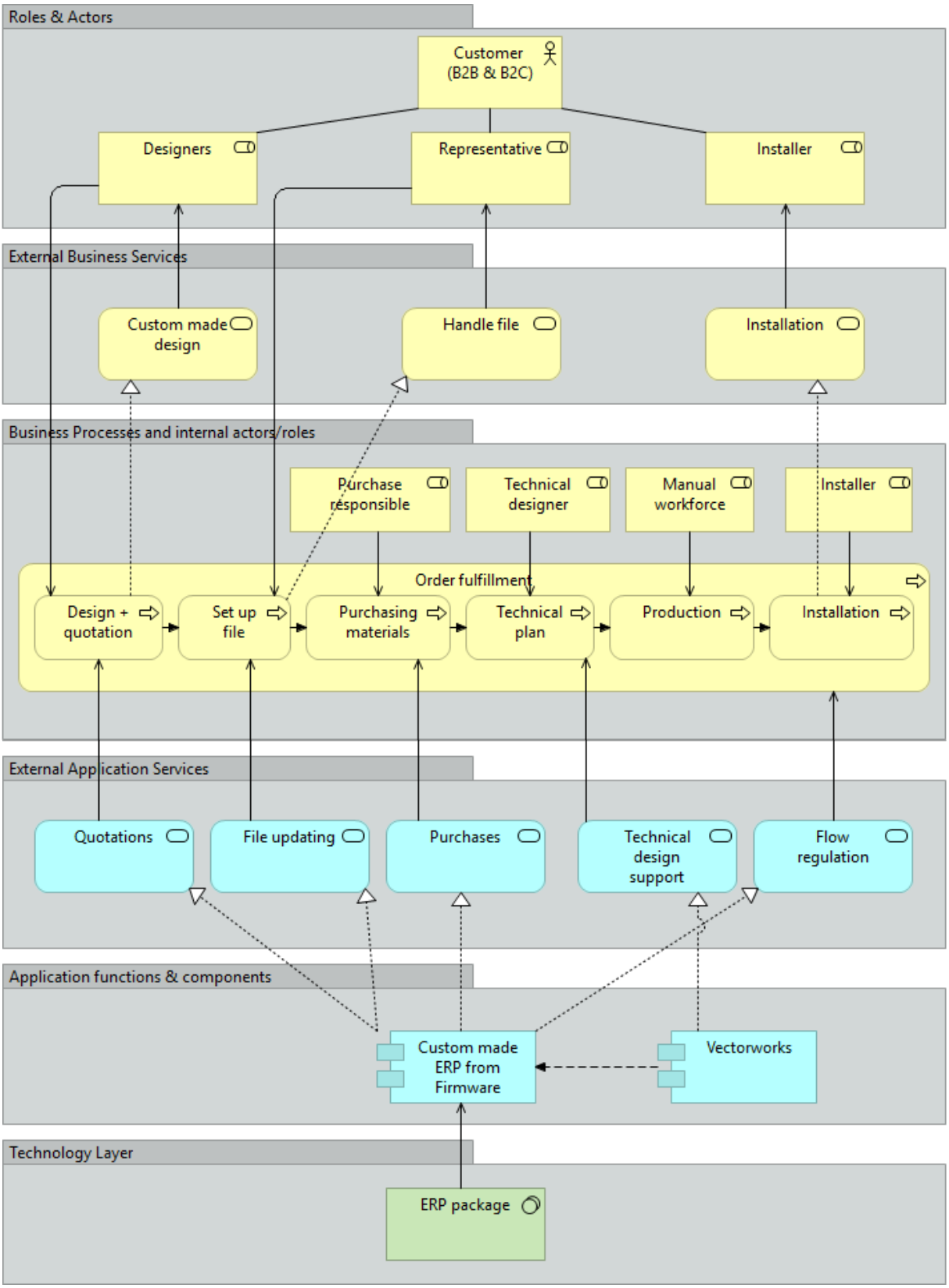
From the moment a client enters the showroom, negotiations start for a first design. The designers makes a first draft along with a quotation. Next, a feedback loop begins, which enables the client to make alterations to the design until it is acceptable. When there is an agreement on the design, a file is made up and a passed on to the representative. Purchases are made to be able to produce the custom-made furniture. A team of technical designers performs the measurements of the client's room(s) and makes a technical plan, which is a more advanced design. Finally, everything is produced and assembled already as completely as possible in order to execute the installation efficiently.

Application Layer

Vossaert collaborated with Firmware to design an ERP package custom made to their process flow. This program is connected to all other programs they might need (Excel, Vectorworks, etc.). This helps the firm to eliminate any mishandling of documents.

Technology Layer

As there is one application that fits all, the technology layer is just this ERP package.



EA Order Fulfilment Process Vossaert Kitchens-Interior

3 Maes Compressors

Business Layer

Roles & Actors

Client (B2B): Maes Compressors used to focus on the whole market segment of contractors and companies that have a need for a (mobile) compressor, a maintenance or a reparation. They recently narrowed their scope of operations to larger companies with more advanced installations.

Representative: There are 5 full-time representatives, each operating in a respective geographic area.

Technicians: The company employs 11 technicians. Each technician has a certain job description. Some are responsible for the installations, some for reparations, some for maintenance.

Service**:** In the service department, 8 employees make sure that everything runs smoothly. When there are issues with a compressor, they will adjust the planning, are responsible for the rental service, etc.

External Business Services

Sales industrial compressor: This is the main responsibility of the representatives. They need to make sure that sales of the compressors do not slow down, which means they play a big part in the growth of the firm.

Installation, Maintenance, Reparation: Technicians are responsible for keeping a compressor up and running. When there are issues, the key priority is to make the reparation to prevent a loss of business for the client.

Rental: The service department arranges the rental of compressors. Sometimes, clients only need a compressor for a limited amount of time. In this case, rental is a more attractive option than buying one.

Business Processes and internal actors/roles

When reviewing the internal processes, there is one main end-to-end process. Within Maes Compressors, it is referred to as the Sales flow (Order fulfilment process).

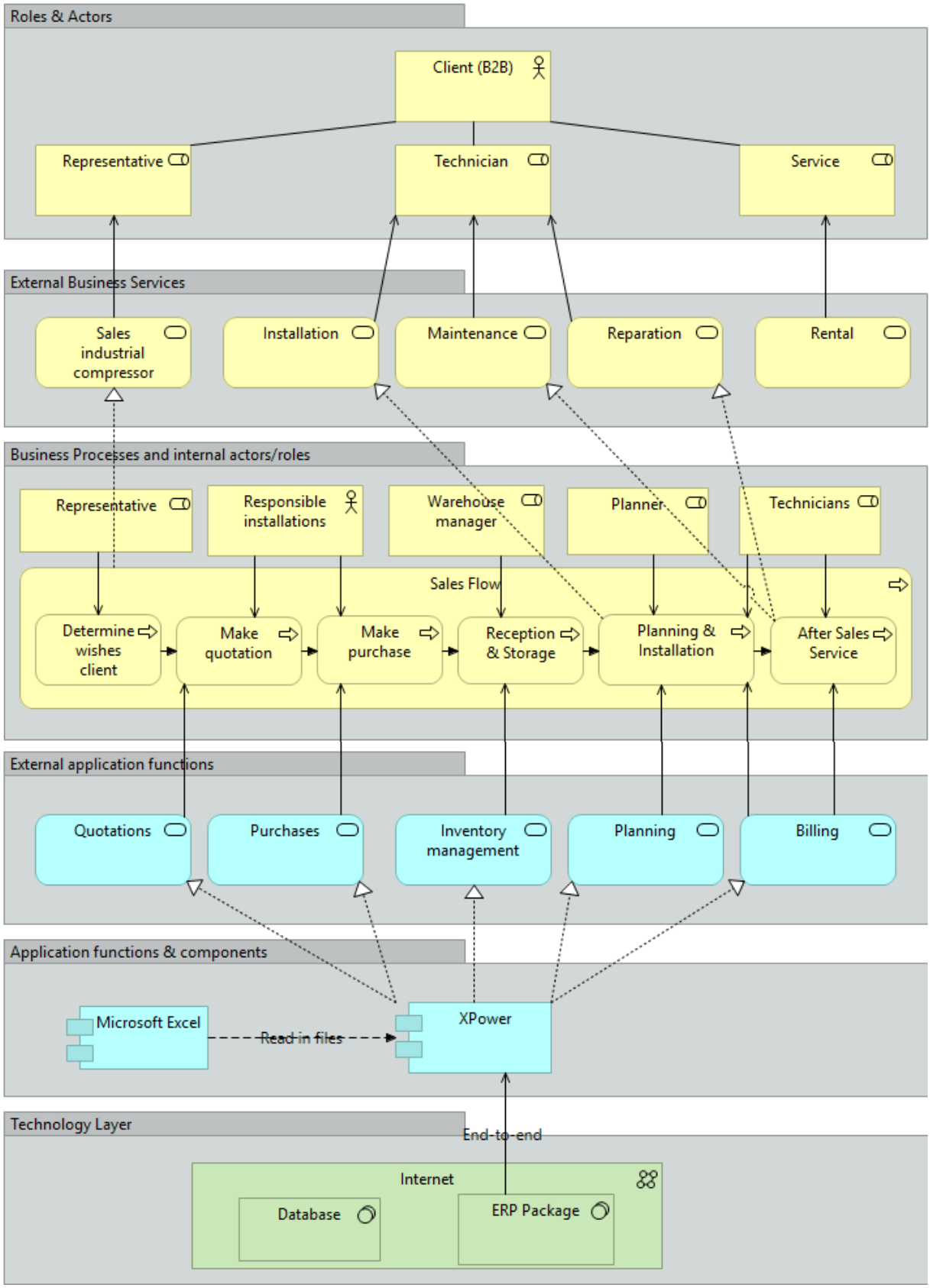
Initially, a representative goes to a potential client and determines what is needed. Next, a quotation is drafted by an employee responsible of installations. These first steps can be iterated until the client confirms the proposition. When this happens, the order is registered in the system. Mostly, the product must be bought from their internationally overarching partner (Atlas Copco). Upon reception, the compressor is stored and the planner is given notice. The installation with the client is then arranged and technicians go on the road to install the compressor. For Maes Compressors, the process does not stop here. They offer after sales services for all their respective sold compressors and sometimes even for compressors from other suppliers. This makes a planning in advance rather difficult. Unanticipated interventions can upset the planning at any time.

Application Layer

The company has an ERP package that covers the whole end-to-end sales flow process, namely XPower. The program works with statuses, going from 0 to 9. This system helps to avoid double work and not to forget certain steps. For example, status 0 is the quotation step. Once the quotation has been approved, the status is increased to 1. This goes on for until step 9, the billing.

Technology Layer

For Maes Compressors, this is rather straightforward. As there is one ERP package that covers the whole process, all data is centralisedd in one place. There are no separate systems for inventory management of making purchases. All is interconnected to avoid misunderstandings.



EA Order Fulfilment Process Maes Compressors