EXTENDING MATURITY MODELS WITH E-PROCUREMENT

Measuring and improving purchasing maturity of purchasing and supply management organisations in digital procurement

TU Delft

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Faculty of Technology, Policy and Management

by

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TU Delft

Preface

Before you lies the dissertation "Measuring and improving purchasing maturity of purchasing and supply management organisations in digital procurement". The master thesis is submitted to the Delft University of Technology in partial fulfilment of the requirements for the degree of MASTER OF SCIENCE in Management of Technology at the Faculty of Technology, Policy and Management (TPM). I was engaged in researching and writing my thesis from February 2021 to August 2021.

Sadly, COVID-19 was largely affecting our lives in the period of writing this dissertation. Working mostly from home was certainly challenging, but we have come a long way. Nonetheless, I would like to express my gratitude to the following people who helped me complete my study.

First of all, I want to thank the members of my graduation committee for their guidance and close involvement. During all the meetings, I received honest and valuable feedback, which led to new insights and a better understanding of the topic. Stefano Fazi was a wonderful supervisor and always prepared to make room in his schedule. Furthermore, Marijn Janssen was both chairperson and second supervisor. Although he was not necessarily required to do so, he still provided in-depth feedback to improve my thesis. I want to thank you both for your excellent guidance and support.

The research study was carried out at the request of a not to be named PSM organisation under the supervision of Juliano Tessaro. Dear Juliano, I would like to thank you for your trust, patience and mentoring. Working with you was a great opportunity and experience to develop myself as a researcher, procurement analyst, and human being. Additionally, I would like to thank Wouter Passtoors for his support and guidance. Many times you were able to help me out with your contagious enthusiasm.

To my other colleagues, I would like to thank you for your wonderful support and kindness. Especially for those who participated in the interviews, this research would not have been possible without your contribution. A particular note of thanks goes to my fellow interns for their company. Although mostly online, I have enjoyed the many hours we spent together. After a short break, I will continue to pursue a career in procurement by working together with Juliano.

Last but certainly not the least, I want to thank my friends, family, peers, and roommates for putting up with me. Special thanks go to my parents, my brother Youri, and my loving girlfriend Anne, for their unwavering support, love and understanding.

I hope you enjoy your reading,

Menno van Dijk
Delft, August 13th, 2021

Executive Summary

Digital transformation in procurement is important for Purchasing and Supply Management (PSM) organisations to develop global organisational competitiveness. Generally, procurement performance can be determined and improved through the use of a maturity model. Existing models do not cover the latest (e-)procurement processes (E-Sourcing, Procure-to-Pay, and Supplier Relationship Management) resulting from digitalisation. Therefore, an extension to existing maturity models was required to assess company performance. A literature study was conducted to describe and explain meaningful concepts in maturity models such as purchasing maturity, maturity profiles and purchasing absorptive capacity. Several maturity models were selected to review and compare the frameworks most suitable for an extension.

An elaborate research methodology was provided to build further on the literature study and guarantee research validity and reliability. Experiences of a major PSM organisation called the *Corporate Group* strengthened the research study by determining key topics and industry best practices, providing a foundation for the extension. A company analysis resulted in an understanding of (digital) procurement and the selection of Schiele (2007) due to its comprehensiveness and affinity with e-procurement. Semi-structured interviews were conducted with procurement experts to review Schiele's model and develop an extension.

The extended model contains an additional domain about spend management and a new dimension covering e-procurement. Multiple purchasing functions, assessment questions, and stage descriptions were developed, whereby the model consists of 56 original and 22 new assessment questions. The new dimension includes Spend & Data Management, Contract Management, Market Intelligence, E-Sourcing, Transactional Procurement, and Supplier Relationship Management. To demonstrate and evaluate the workings of the extended model, it had to be tested on a purchasing company. The *Corporate Group* consists of multiple companies, and one of them, *Entity A*, provided the ideal opportunity to test the extended model through a multiple-case study. Maturity assessments were conducted of several operating companies (OpCos) to determine maturity levels and compare results. Several propositions were tested to determine whether the extended model measured what it intended to measure, namely the purchasing maturity.

The extended model was able to quickly provide a fitting performance overview and guide the OpCos towards performance improvements. A proper alternative for third-party audits was provided, including a digitalised approach to process data easily. However, comparing results among OpCos outside of their sub-unit delivered an unexpected outcome. It was questionable whether the model actually measured purchasing maturity or rather the perception of it. This research study conducted self-assessments where the OpCos provided the maturity levels themselves. Although the results of both the original model and the e-procurement dimension were unexpected, the extension appeared to be more accurate. This was most likely due to the elaborate stage descriptions, making it easier for the assessors to identify stage levels.

This research study provided a foundation for assessing e-procurement using an extended maturity model but limited itself to the *Corporate Group*. Thereby, it confirmed the criticism regarding the four stages being too rigid. Potential future research is recommended to improve both the extended model as well as the assessment approach. First, it must be shown to what extent e-procurement is covered in the new dimension and whether the extended model can be sufficiently generalised. Interviews should be conducted with procurement experts from different companies or industries to validate the extension through statistical analysis. Secondly, the assessment approach could be improved by including a control person and more experienced people to conduct the assessments, ensuring critical thinking and more realistic maturity levels. Self-assessments are not necessarily less reliable compared to external audits, but they rather need support to guide the process through a standard protocol. The subsequent step should be to formalise a proper action plan to initiate improvement.

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Glossary

absorptive capacity

The firm's ability to value, assimilate and utilise external knowledge. 4, 17, 35

category management

A distributor/supplier process of managing categories as strategic business units, producing enhanced business results by focusing on delivering consumer value. 21, 32

change management

Several disciplines aiming to drive the adoption of innovation and technology through project initiatives. 21, 36

cross-functional integration

The process of combining various functional business activities within an organisation by bridging the boundaries and enabling the flow of information among the various organisational functions. 3, 20, 36

direct procurement

Direct procurement is the sourcing of all goods and services that are directly related to the manufacturing of the sales product (e.g. raw materials, semi-finished products). 27, 31

e-procurement

Digital or electronic procurement refers to the use of (commonly) web-based information and communication technologies to carry out some or all stages of the procurement process.. 1, 5, 11, 20, 31

indirect procurement

Indirect procurement is the sourcing of all goods and services that do not directly go into a product or the production process but enable a business to maintain and develop its operations (e.g. transport, operating expenses). 27, 31

maturity model

The description of several auditable stages an organisation is expected to go through in its quest for greater sophistication. 1, 3, 11, 20, 36

procurement

The process starting from the initial need identification by users through search, sourcing, negotiation, ordering, and receipt, to post-purchase review. 1, 3, 13, 20, 31

purchasing maturity

The level of professionalism in the purchasing function. 1, 3, 11, 20

sourcing lever

A sourcing lever is defined as a set of measures that can improve sourcing performance in a commodity group. 4

Acronyms

B2B	Business-to-Business
CM	Category Management
CoE	Centre of Excellence
ERP	Enterprise Resource Planning
FTE	Full-time Equivalent
GDPR	General Data Protection Regulation
ICT	Information & Communications Technology
M&A	Mergers and Acquisitions
MI	Market Intelligence
MOT	Management of Technology
NPR	Non-Product Related
OpCos	Operating Companies
PDW	Procurement Data Warehouse
PEx	Procurement Excellence
PSM	Purchasing and Supply Management
PPR	Procurement Performance and Reporting
P2P	Procure-to-Pay
S&D	Spend & Data
SOP	Standard of Operations
SRM	Supplier Relationship Management
S2C	Source-to-Contract
TCO	Total Cost of Ownership

Chapter 1: Introduction

Purchasing and Supply Management (PSM) plays a vital role in developing global organisational competitiveness. According to Bals, Schulze, Kelly, and Stek (2019), 60 to 80 percent of total costs are externally paid (e.g. supplier expenses). This emphasises the importance of PSM in extending organisational boundaries and managing external networks. PSM is commonly referred to as procurement, and it is defined as a complex and elaborate process that starts from initial need identification by users through searching, sourcing, negotiation, ordering, and receipt to post-purchase review (Croom & Brandon-Jones, 2007). If properly executed, procurement departments with a higher degree of digitalisation benefit from higher efficiency and the reduction of administrative and manual tasks (Bauer & Göbl, 2019). Especially integrated and universally connected systems have a significant benefit on efficiency. Digital transformation is thus reshaping supply chains' operations by providing a drive towards frictionless processes and effortless decision-making (Tilley, Liddell, Barrett, & KPMG, 2019). E-procurement is the equivalent of digital transformation specifically for PSM organisations, focusing on the use of integrated communication systems (primarily web-based) for the entire purchasing process (Croom & Brandon-Jones, 2007). Although digitalisation offers an efficient method of delivering a valued proposition, it is far from a simple change that can be implemented overnight.

Generally, the procurement performance can be determined and improved through the use of maturity models. Maturity models provide a framework for evaluating the maturity of PSM organisations on specified purchasing functions and present guidelines to develop immature organisational aspects towards sophisticated practices professionally (Andreasen & Gammelgaard, 2018; Schiele, 2007). However, digital transformation demands a model to include the latest procurement processes resulting from digitalisation to measure and assess the maturity of today's firms. These processes include the automation of Procure-to-Pay (P2P) and the accomplishment of predictive Source-to-Contract (S2C) and proactive Supplier Relationship Management (SRM) (Daher et al., 2017), but also more broadly the improvement of analytical and reporting capabilities and modernisation of procurement application platforms (Gibbons & Walden, 2020). Existing models do not (fully) cover e-procurement and there is the need for a new or extended maturity model.

Procurement requires the acceleration of digital transformation, but with the introduction of e-procurement and corresponding trends, the models appear to have stayed behind. Maturity models originated from developing various purchasing function configurations to describe the maturity level of firms (Cousins, Lawson, & Squire, 2006). These configurations have led to practitioner-based models, which facilitated the measurement of purchasing maturity. Prior to 2017, at least sixteen different maturity models have emerged (Andreasen & Gammelgaard, 2018). Even if the literature extensively covers maturity models, they fail to provide insight regarding e-procurement. It is a missed opportunity and indicates a possible knowledge gap in the scientific literature. Barth and Koch (2019) emphasised that Information & Communications Technology (ICT) should be considered an integral part of the organisation since they affect operational efficiency. However, purchasing maturity is not strictly related to IT and rather complementary to the overall purchasing strategy of the firm (Luzzini, Longoni, Moretto, Caniato, & Brun, 2014). Therefore, further research must be conducted to incorporate e-procurement into existing models. Ultimately providing insights into their relation to e-procurement.

This research study aims to extend existing maturity models to enable the measurement and improvement of purchasing maturity of PSM organisations by including e-procurement in a qualitative manner. The study begins with a review of purchasing maturity and PSM maturity models, followed by addressing e-procurement to understand to what extent this is covered in maturity models. The literature study should provide the eligible models for an extension and clearly define the knowledge gap in the literature. Next, the research methodology should acquire insights into the extension of an existing framework. As support of this study, the case of a

purchasing company is available, which enables the identification of industry best practices and evaluation of the extended framework. One of the main findings of the thesis is that Schiele (2007) provided the most suitable framework to allow for an extension on e-procurement.

Thesis outline

The structure of the research study consists of two segments. At first, Chapter 2 provides the exploratory research that will investigate the problem at hand. Subsequently, Chapter 3 provides a detailed description of the research methodology and its relation to the case study. After that, Chapter 4 provides the foundation for selecting and extending a model by analysing industry best practices and pinpointing interview topics. Furthermore, semi-structured interviews will be conducted with procurement experts to evaluate the selected framework and extend on e-procurement. The extension of a maturity framework in Chapter 5 will kick off the second segment of this research study. Maturity assessments will be done to evaluate the extension and discuss the scientific and managerial implications of the research. Then, Chapter 6 will present the research conclusion, scientific and managerial implications, limitations, and potential future research directions. The literature references will complement this research study.

Chapter 2: Literature Study

This chapter will first discuss the literature on purchasing maturity and corresponding maturity models. Subsequently, existing models will be described and selected to determine the most suitable frameworks. Furthermore, the inclusion of e-procurement will be reviewed. The chapter will be complemented with a final knowledge gap definition and an overall conclusion.

2.1 The Current State of Purchasing Maturity

The introduction already indicated that various models had been developed throughout the years to describe and determine the purchasing maturity level of PSM firms (Cousins et al., 2006). However, the main aspects of purchasing maturity will be discussed first before different models will be described and compared.

2.1.1 Defining purchasing maturity

A company should perform better when it shows greater maturity. Therefore, purchasing maturity will enhance the quality of an organisation's purchasing functions, which positively contributes to the firm's performance. In this case, purchasing maturity should include both the activities of strategic, tactical and operational procurement. Existing PSM literature has accepted purchasing maturity as the terminology to describe and address the effective performance of PSM organisations change processes (Andreasen & Gammelgaard, 2018; Foerstl, Hartmann, Wynstra, & Moser, 2013). It even appears that PSM literature has appointed maturity models as the leading frame of reference because only a limited amount of literature goes beyond the maturity model viewpoint (Ramsay & Croom, 2008).

More recent research studies commonly use the term PSM development instead of purchasing maturity (Adams, Kauffman, Khoja, & Coy, 2016; Andreasen & Gammelgaard, 2018; Bemelmans et al., 2013). Adams et al. (2016) provided the following description, which is considered to be the lead definition in this research: "the process of evolution from an unsophisticated cost-focused action-based function to a sophisticated form in which purchasing decisions are directly linked to the strategic needs of the firm".

2.1.2 Maturity profiles

Multiple purchasing functions have to be assessed to measure and determine a firm's purchasing maturity. Each purchasing function can be divided into several stages to assess its level of maturity. Although various maturity models differ in the number of stages, ranging from three to six, many research studies agree there are no specific activities that characterise going to the final stage (Cousins et al., 2006; Van Weele, Rozemeijer, & Rietveld, 1998). However, a model commonly uses 4 stages per purchasing function. If a purchasing organisation reaches stages 3 and 4 for most functions, it is considered highly developed, and it should not depend on individual performance. A well-structured organisation is then able to perform well despite possible personnel turnover. The stage level can be identified by either asking a firm to score their use of suggested tools, methods and approaches or conduct third-party purchasing audits. This will be further touched upon in Chapter 3. Generally, the stages are defined as levels 1-4 or 0-100%, but then it could be difficult to distinguish between the stages when a maturity level between two of them. The most comprehensive stage definitions to guide the maturity assessments are provided by Schiele (2007):

- **Stage 1**: A particular best-practice activity/tool/method is known within the organisation.
- **Stage 2**: A position or person is assigned to perform the task.
- **Stage 3**: The process for completing the task is defined and documented as well as applied.
- **Stage 4**: Cross-functional integration in the company is assured while basic requirements are met.

Criticism on maturity models
Although it appears that PSM literature has appointed maturity models as the leading frame of reference, there is also valid criticism on the use of maturity models from both PSM literature as well as external research. The main issues will be described and discussed below.

1. The organisational change in maturity models is criticised for missing features that effectively can explain change interventions (McDonald, 2015). Thereby, there could be a lack of theoretical clarity, including what is meant by the concept of change (Suddaby & Foster, 2017). It is even suggested that commonly a sound empirical and theoretical base is absent, and guidance is not provided to improve the organisation (Maheshwari & Janssen, 2013). These issues mainly relate to what extent guidance is provided through the stage descriptions. It seems a higher level of comprehensiveness could tackle this issue.

2. According to Andreasen and Gammelgaard (2018), existing PSM maturity models are too rigid for PSM managers to apply. This criticism relates to the strict limits in the form of stages attached to each purchasing function. Therefore, maturity models may produce the opposite effect of what is intended, and expectations that the use will result in increased status and influence of PSM within the organisation may not be met. Increasing the number of stages or expressing the maturity level as a percentage could solve this issue.

3. There is also criticism on stage models in general. Klievink and Janssen (2009) argued that stage models might be conceptually appealing, but usually, these models lack empirical validation, are fixating on the level of individual organisations, and provide little practical support. The latter is in line with the strict stages. It was argued that stages should be skipped if a company has the right capabilities for higher stages. This is called a growth model, which is different from the traditional way of progressing through stages of maturity. Additionally, there is not always a need to reach the higher stages.

The issues will be considered when reviewing the various models, extending an existing model, and explaining the results. However, the main focus is not to directly solve them. The literature clearly shows the limitations of linear stages, but there is no better alternative to assess purchasing maturity. Developing a growth model would be beyond the capabilities of this research study. Thus, the only way to proceed is to improve existing models. Thereby, the advantages of maturity models should also not be devalued. They provide a quick solution to determine company performance and, to a certain extent, show how functions with low maturity can be improved.

Additional concepts in maturity models
Apart from the number of stages and corresponding definitions, certain concepts can be included in the maturity profile and expand the maturity assessments. The literature provides two additional concepts integral to the maturity profile: the measurement of cost savings and the phenomenon called purchasing absorptive capacity. These will be described below to determine whether either one of them or both should be considered.

- **Cost savings**. Complementary to the maturity model, Schiele (2007) measured cost savings through commodity workshops to determine a firm's performance of purchasing. A method called sourcing lever analysis describes tactics to achieve sourcing targets for diverse categories of materials or services (Hesping & Schiele, 2016). Recent research studies are still trying to extend the analysis and provide frameworks to improve and conceptualise measurements (Bals, Laine, & Mugurusi, 2018; Hesping & Schiele, 2015, 2016).

- **Purchasing absorptive capacity**. Although the literature agrees purchasing maturity affects a firm's performance, Schiele (2007) also tried to find an explanation for this. Purchasing absorptive capacity is defined as a firm's ability to value, assimilate and utilise external knowledge. It was concluded that firms with a higher level of maturity tend to identify higher savings potential when analysing their commodity groups.

Conducting commodity workshops and a sourcing lever analysis is unfeasible and, thus, outside the scope of the research. However, it could be interesting for future research. Further explanation is therefore provided in Appendix A. On the other hand, purchasing absorptive capacity could be an interesting addition to the concept of purchasing maturity and will therefore be further described below.

2.1.3 Purchasing absorptive capacity

An elementary organisation has a lower chance of achieving substantial financial results than a mature purchasing organisation. Purchasing absorptive capacity could explain this phenomenon because absorptive capacity is likely to be higher for more mature firms. After all, purchasing departments will learn more from their environment if they have a higher maturity level. Although other models did not touch upon this topic, other and more research studies besides Schiele (2007) do.

Maturity profiles measure several elements that have been found to influence absorptive capacity. Key examples are the organisational structure, internal knowledge sharing through cross-functional integration, and partner and supplier management. It appears there are still some steps to take, especially regarding the assessment of organisational- and IT capabilities. This is also where the concept relates to e-procurement capabilities, but this will be further researched in Section 2.3

The absorptive capacity concept argues that there is a minimum point of maturity. This point depicts the minimum benefits an organisation needs to have achieved to profit from the introduction of best practices (Schiele, 2007). Different levels of maturity require different techniques for development. Highly mature organisations usually have sufficient absorptive capacity and can try to absorb best-practice knowledge immediately. Research by Ellram, Zsidisin, Siferd, and Stanly (2002) found that firms with poor financial results were introducing the largest number of best practices but were not profiting sufficiently from them. A visualisation of the concept of the minimum maturity point is provided in Figure 2.1. A firm should actually be ready to implement new tools and thus, this should be taken into account when prioritising improvements.

The bottom line is that purchasing departments would learn more from their environment if they have a higher maturity level (Schiele, 2007). Applying this concept of absorptive capacity to modern PSM organisations would suggest that the more mature a company is, the more they optimally use the digital tools and programs. This section described and discussed purchasing maturity, maturity profiles and absorptive capacity to provide sufficient insight to review existing maturity models in the next section.

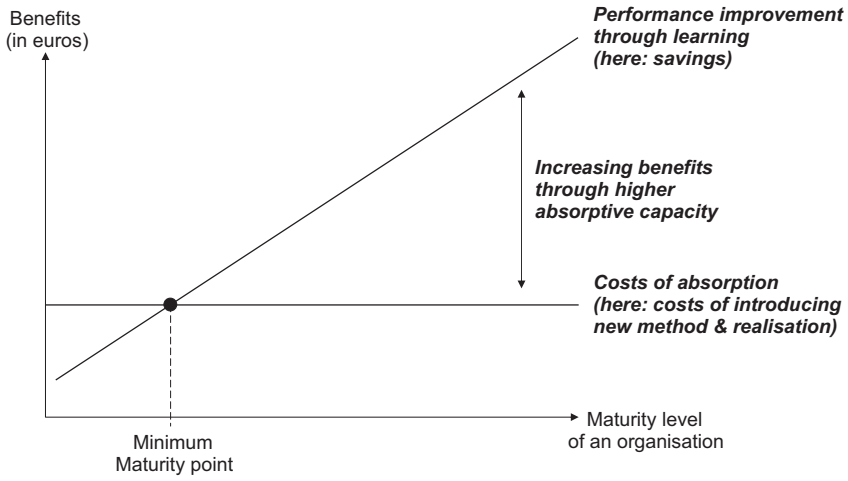

Figure 2.1: The minimum maturity point according to Schiele (2007)

2.2 Suitable Maturity Frameworks

A common approach to achieve sophisticated PSM practices is explaining and understanding the required professional development through a maturity model (Andreasen & Gammelgaard, 2018). Maturity models can be either purchasing function configurations or practitioner-based models and are well explored by the literature. This section will narrow down the selection by comparing the different maturity models and determining which ones are suitable.

2.2.1 Maturity model overview and requirements

A maturity model can provide either an elementary viewpoint or a comprehensive framework to measure and improve the purchasing maturity of a firm. A wide variety of models are available, considering at least sixteen different maturity models originated from 2017 and before. Andreasen and Gammelgaard (2018) provided a literature review of those models and compared them based on their stage terminology, methodology and number of citations. An overview of these reviewed maturity models is shown in Table 2.1. Andreasen's model review is elaborate and appears to cover almost all the available models, but two additional models were found to be excluded and therefore, added to the table. Although the literature well explores maturity models, they seemingly imply a lack of including e-procurement.

Table 2.1: Overview of maturity models based on Andreasen and Gammelgaard (2018). Citation data was obtained on 02.01.2017, and two additional models are included at the bottom.

Reference	Maturity stage terminology	Methodology	Citations
Kraljic (1983)	Purchasing management, materials management, sourcing management, supply management	Conceptual	2310
Van Weele (1984)	Operational purchasing administrative function, commercial function, part of integrated logistics management, strategic business function.	Empirical - survey interview	23
Reck and Long (1988)	Passive, independent, supportive, integrative	Empirical - field interviews, case study	313
Syson (1989)	Clerical (transactional), commercial, strategic (proactive focus)	Conceptual	22
Bhote (1989)	Clerical, commercial, strategic	Conceptual	84
Freeman and Cavinato (1990)	Buying, purchasing, procurement, supply management, facilitated networks	Empirical - field interviews	209
Keough (1993)	Serve the factory, lowest unit cost, coordinated purchasing, cross-functional purchasing, world class supply management	Conceptual	151
Burt and Doyle (1993)	Reactive, mechanical, pro-active, strategic supply management	Conceptual	143
Chadwick and Rajagopal (1995)	Clerical, commercial, supportive, strategic	Conceptual	65
Barry et al. (1996)	Basic MRO purchasing processes, enhanced, MRO procurement practices, world-class MRO procurement practices	Empirical - field interviews	29
Anderson and Katz (1998)	Leveraged buy, linked buy, value buy, integrated sell	Conceptual	303
Van Weele and Rietveld (2002)	Transactional orientation, commercial orientation, purchasing coordination, internal integration, external integration, virtual integration	Conceptual	16
Cousins et al. (2006)	Undeveloped, celebrity, capable, strategic	Empirical - survey	166
Paulraj et al. (2006)	Nascent, tactical, advanced	Empirical - survey	212
Schiele (2007)	Four stages measured by procurement planning, the structural organisation of the purchasing function, process organisation and purchasing's embeddedness in the firm and purchasing controlling structures	Empirical - survey	129
Johnsen et al. (2014)	Clerical, developing, supportive, strategic contributor	Conceptual	13
Additional models			
Bemelmans et al. (2013)	Six stages equal to Van Weele and Rietveld (2002)	Case study	-
Úbeda et al. (2015)	Five stages based on Reck and Long's (1988) model.	Conceptual	-

The maturity models in Table 2.1 are primarily identified through the review by Andreasen and Gammelgaard (2018). It appears to be rather complete, besides the identification of two additional models. However, this research study does not aim to review all the models shown in the table. Before reviewing the models, requirements for selecting suitable maturity models should be formulated first to easily reduce the selection. A model is considered to be suitable when it meets the two requirements shown below. The first requirement will be further covered in this section. At the same time, the latter will be touched upon in Section 2.3, but it can only be fully determined after acquiring insight into industry best practices through a company analysis in Chapter 4.

- A model must provide a framework applicable to PSM organisations.
- A model must (partly) include e-procurement or allow for an extension.

2.2.2 Maturity model review

The models range from 1983 to 2014, where the earlier established models usually provide the basis for the more recent ones. Several of these models are conceptual or are considered to be purchasing function configurations and cannot be directly applied to organisations. Many of the models are also relatively old and would not provide a realistic overview of contemporary firms. Only five of the sixteen models reviewed by Andreasen and Gammelgaard (2018) have been developed in the current century. Although conceptual and older models can still be evaluated and extended, it is beyond the scope of the research to create a framework for non-practitioner-based models. Nonetheless, they can still be used to draw learnings from.

Major developments have been made in the area of (e-)procurement, and therefore, all the models are slightly outdated. The most recent model was developed in 2014 by Johnsen, Howard and Miemczyk, but it won't be considered due to the lack of access. Thereby, this model is barely referred to by other academic PSM experts and is thus, considered less prominent. Further research resulted in the identification of two additional models by Bemelmans et al. (2013) and Úbeda, Alsua, and Carrasco (2015). Bals et al. (2019) strengthens the observation that maturity models have become obsolete by claiming that the most prominent new competency areas in PSM are related to digitalisation (e.g. e-procurement technology, automation), innovation (e.g. innovative sourcing) and sustainability. However, Cavinato (1992) emphasised that communication and accordance between procurement and other departments are at least as important. Therefore, it is presumed that not any model will provide a perfect fit. Available models provided by Andreasen and Gammelgaard (2018) and additionally retrieved models should be reviewed to determine which frameworks are comprehensive and allow for an extension. These should then be assessed to what extent they include the firm's purchasing performance of e-procurement.

Reducing the selection

Although there are various PSM maturity models, they are only slightly different and associated with a range of similarities (Andreasen & Gammelgaard, 2018). Since this research study won't provide a systematic literature review on maturity models, the focus will be on applicable maturity frameworks. The following models meet the first requirement and thus, provide a framework applicable to PSM organisations: **i)** Cousins et al. (2006), **ii)** Paulraj, Chen, and Flynn (2006), **iii)** Schiele (2007), and **iv)** Bemelmans et al. (2013). Úbeda et al. (2015) will be disregarded because it did not develop a new model and merely confirmed Schiele's findings. The other models, mostly earlier ones, are rather conceptual without an empirical test. They would lean more towards purchasing function configurations or simpler versions. Therefore, this research will focus on the four aforementioned models.

Reviewing the selection

In developing the four aforementioned models, researchers mostly focused on prior models shown in Table 2.1. This emphasises the small and deeply connected world of PSM literature, but it also explains the many similarities among the models. The four maturity models are shown in Appendix B. The scope, principles, and limitations will be described and discussed below.

- **Scope**

Cousins et al. (2006) conducted a cross-sectional survey using a hypothesis test to build further upon the research of Reck and Long (1988). It resulted in an empirical test of purchasing function configurations to measure and improve organisational performance. Paulraj et al. (2006) provided statistical analysis from a survey on strategic PSM constructs to extend several research studies (Van Weele (1984), Reck and Long (1988), and Freeman and Cavinato (1990)). However, it was very much focused on the effect of the strategic level of purchasing on a firm's performance and its suppliers.

Schiele (2007) developed a comprehensive maturity instrument to measure and improve purchasing maturity as a function of financial performance. In contrary to former literature, multiple models (ten) were compared and taken into account. While the scope of the former three models was on general purchasing, Bemelmans et al. (2013) also took into account multiple models but specifically focused on the construction industry. A quick scan purchasing maturity instrument was developed for prime contractors to determine the level of purchasing maturity and provide possibilities for improving performance.

- **Principles**

Cousins et al. (2006) and Paulraj et al. (2006) primarily argued there was a lack of empirical evidence in prior research. Although they both identified 8 purchasing functions, Paulraj's provided 52 assessment questions, which is significantly more than Cousins's 24 items. Cousins attached 4 stages to each question without a definition, while Paulraj's model uses three stages: Level 1, 2, and 3.

Schiele (2007) concluded that most of the existing models lacked to completely orient to a managerial perspective. Therefore, Schiele developed a five-dimensional profile of purchasing maturity distributed over 19 domains. This ensured a clear overview considering the model touches upon 56 purchasing functions distributed over 19 domains. Schiele's stage definitions were provided early on, but distinguished them as quadrants (0-25%, 26-50%, 51-75%, and 76-100%). Bemelmans et al. (2013) on the other hand, already linked the 20 purchasing functions to one or more of the 6 different stages. Each function was then rated as a percentage. For each model applies that the maturity level for a function is then determined based on theory or data analysis.

- **Limitations**

Upon review, the models of Cousins et al. (2006) and Paulraj et al. (2006) are only briefly described. There is a lack of providing clear stage descriptions. Despite stage descriptions not being a prerequisite, it does contribute to a more precise assessment process and accurate benchmarking. Thereby, both models are abstaining from considering additional factors that influence purchasing performance. Cousins et al. (2006) slightly touched upon spend analytics and supplier information management, while Paulraj et al. (2006) only but more elaborately touches upon supplier information management.

Schiele (2007)'s model is more comprehensive and included stage descriptions for every function. Still, they do not always precisely address how an organisation needs to improve the function to get to the next stage. Schiele additionally took into account the measurement of cost savings and purchasing absorptive capacity. For the model of Bemelmans et al. (2013), it is unclear how the instrument should be applied to an organisation. Besides the visualisation and function definitions, the research lacked insight into the workings of the instrument.

2.2.3 Model comparison

Table 2.2 summarises the main characteristics of each model. Even though Bemelmans et al. (2013) included all the different topics, the first requirement is not met. The framework was shown, but the research study refrained from showing how to apply the maturity instrument properly. The other three models meet the first requirement, and are, contrary to Bemelmans et al. (2013), empirically validated. The concepts will be used in the next section to determine the inclusion of e-procurement. However, as observed earlier, it must be emphasised that they all lack to address the actual change processes of PSM organisational practices. Furthermore, it seems Schiele (2007) provided the most comprehensive framework, and thus, provides the most guidance towards improvement. On the other hand, such a level of detail may not be required, nor does it mean it would be the best fit to include e-procurement. The next section will further focus on the three suitable models and their relation to e-procurement.

Table 2.2: Comparison of maturity models, partly based on Schiele (2007)

	Cousins et al. (2006)	Paulraj et al. (2006)	Schiele (2007)	Bemelmans et al. (2013)
Scope	General purchasing			Construction industry
No. of stages	4	3	4	6
No. of items for assessment	52	24	56	20
Topics included:				
Planning			✓	✓
Structural organisation			✓	✓
Process organisation			✓	✓
Human resources	✓		✓	✓
Controlling	✓	✓	✓	✓
Collaborative supply relation	✓	✓		✓

2.3 The Inclusion of E-Procurement

The former section provided three suitable maturity models to improve and apply to PSM organisations. The three maturity profiles provide the opportunity to measure several elements that have been found to influence absorptive capacity. Therefore, this section will describe e-procurement, link it to absorptive capacity and determine the inclusion in the three profiles.

2.3.1 E-procurement

E-procurement should first be described before the maturity profiles of the three models can be reviewed to determine possible inclusion. Digital procurement is the application of disruptive technologies, consisting of three pillars: **(i)** increasing the predictiveness of Strategic Sourcing (S2C), **(ii)** automating Transactional Procurement (P2P), and **(iii)** enabling the proactiveness of SRM Daher et al. (2017). Appendix C displays the various technologies of today in procurement and their level of deployment. The core capabilities are: spend analytics, e-sourcing, e-catalogues, contract management, supplier information management, e-procurement, e-invoicing, and e-auctions. These procurement technologies are advancing rapidly, moving through a regular cycle from emerging to maturing, until widely adopted as core capabilities. Although the emerging and maturing technologies are mainly interesting in the future, the core capabilities should be at least present in assessing purchasing maturity.

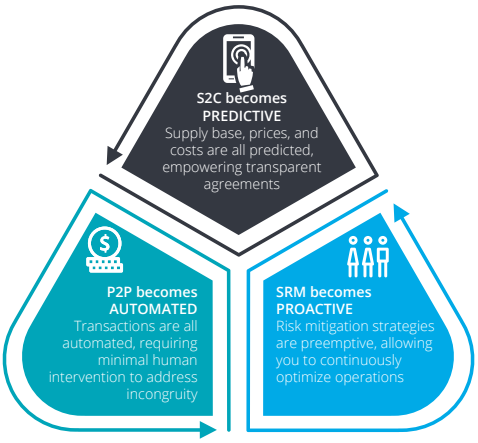

Figure 2.2: The characteristics of digital procurement according to Daher et al. (2017)

2.3.2 Absorptive capacity and e-procurement

Absorptive capacity is also connected to the IT capabilities of a firm and its personnel. Liu, Ke, Wei, and Hua (2013) argued that a firm's IT capabilities, both flexible IT infrastructure and IT assimilation, play a large role in the improvement of absorptive capacity. This supports the earlier observation that e-procurement has an enormous impact on the procurement performance of firms. However, just because a technology or tool is provided to employees does not necessarily mean it will be efficiently used or used at all.

The most recent study by Frimpong, Andoh-Baidoo, and Asamoah (2020) on absorptive capacity builds further on this observation. This research study looked into the association between institutional absorptive capacity, e-procurement assimilation and the procurement process in the public sector. E-procurement facilitates governments and organisations with an efficient and effective method of tendering information processing and reduces human errors. This

enhances transparency and should lead to fairness in the bidding process. Rai, Brown, and Tang (2009) on the other hand, focused on the private sector. It was identified that online reverse auctions, e-catalogue management, e-order fulfilment, e-payment, and e-settlement act as moderate complements for the performance of the procurement process. These capabilities are similar to the ones mentioned by Daher et al. (2017).

Frimpong et al. (2020) confirmed that absorptive capacity drives the adoption and assimilation of e-procurement. Regardless of a company's economic and industrial background, technology and innovation contribute to a faster and more efficient procurement process. The extent of e-procurement application usage within an organisation depends on absorptive capacity because a high level will result in deep assimilation. The absorptive capacity of procurement actors can then be increased by focusing on the competence in using e-tools and creating understanding by information sharing through effective communication networks. The three models slightly touched upon certain topics of e-procurement, but only to the bare minimum. However, all three models meet the second requirement and provide the opportunity for an extension.

2.4 Conclusion Literature Study

The literature review described the current state of the literature on purchasing maturity, maturity profiles and purchasing absorptive capacity. Maturity frameworks were then reviewed, compared and selected. Although many maturity models have been developed for PSM organisations, Cousins et al. (2006), Paulraj et al. (2006), and Schiele (2007) are the only three studies that provide a framework suitable for an extension on e-procurement. Purchasing absorptive capacity is related to e-procurement and partly embedded in the maturity profile of Schiele, but not to the full extent. While Cousins and Paulray do not touch upon this concept, it could be included through an extension. A good basis has been provided to define the knowledge gap and resulted in the research question below.

How to measure and improve the purchasing maturity and performance of PSM organisations in digital procurement?

The maturity profiles and the influence of purchasing absorptive capacity suggest that the current models lack a proper fit for purchasing firms using e-procurement. Although this literature study described e-procurement, a company analysis of a large PSM organisation is required to determine key topics and industry best practices to provide a foundation for the extension. The company analysis will be explained in the next chapter and its focus will be on the complex company structure, the key functions of the procurement process, and corresponding digital technologies. Once the maturity model has been extended, it should provide an assessment instrument that can be demonstrated and evaluated with the help of a multiple-case study. If the instrument has proven itself, future research could verify whether it applies to other firms. However, the next chapter will first focus on the exploratory research methodology and multiple-case study.

Chapter 3: Research Methodology

The literature review has shown that various maturity models for procurement organisations have been developed throughout the years, but all lack to properly include digital procurement. Therefore, this research attempts to select and extend one of the models with e-procurement. This chapter will first describe the research design by describing the research objectives, questions and strategy. Subsequently, the research methods will be discussed for the exploratory research and multiple-case study. Finally, the research validity and reliability will be discussed.

3.1 Research Design

This section will first describe the research objectives and main activities. Thereafter, the research questions will be described and explained. Finally, The research strategy will be presented.

3.1.1 Research objectives and main activities

The main objective of this research is: *"to measure and improve purchasing maturity and performance of PSM organisations in e-procurement"*.

The research objective called for exploration and description of maturity models, purchasing maturity, and e-procurement, as has been done in Chapter 2. According to the definition of Baxter and Jack (2008), this research required a qualitative approach. However, the research methods will be further elaborated on in the next sections. The literature study paved the way for selecting a suitable framework to, later on, extend one of the three maturity models. The following three key activities build further on this:

- Determining critical e-procurement domains by conducting a company analysis. The analysis is supported by the literature and internal documents, focusing on: the organisational structure, the procurement process, and e-tools.
- Selecting a suitable maturity model eligible for an extension, based on the literature study and company analysis.
- Interviewing experts and key figures to acquire insight into the identified e-procurement domains and verify and confirm obtained information.

These three key activities should result in the extension of a selected maturity model. The extended model should then be able to assess the purchasing maturity of PSM organisations, including e-procurement domains. The maturity levels of various purchasing functions of several business units within *Entity A* will be determined to demonstrate the workings of the model and evaluate its performance. If the extended model appears to be successful, directors and managers of *Entity A* are able to use it to assess company maturity and guide them to purchasing enhancements, including functions within e-procurement. Thereby, it may create an initiative for maturity assessments of other PSM organisations. Although time and circumstances did not allow for it, the following activities would initially have been part of this research:

- Conducting performance workshops and a sourcing lever analysis to determine the additional purchasing performance of *Entity A*'s business units.
- Benchmarking *Entity A* by analysing its position within the industry.

3.1.2 Research questions

The former subsection described the research objectives, which can be translated into a research question and sub-research questions. The main research question was already defined in Chapter 2 and will be repeated as follows:

How to measure and improve the purchasing maturity and performance of PSM organisations in digital procurement?

According to Yin (2003), a "how question" is typical for a case study approach. Therefore, it strengthens the choice for a qualitative study. The sub-questions support the main research question by focusing on the challenges related to the extension and maturity assessments. The following sub-questions were defined:

1. What is a suitable approach to measure purchasing maturity?
2. How does e-procurement relate to existing maturity assessments methods?
3. How should e-procurement be incorporated in maturity assessments?
4. How to measure and improve the purchasing maturity of *Entity A*?
5. How is the performance of the extended maturity model?

Sub-question 1 & 2 were covered in the literature study (*Chapter 2*) and partly referred to the aforementioned requirements. Maturity models have been established as the most suitable approach to measure purchasing maturity, meaning a framework is present and directly applicable to PSM organisations. Subsequently, a model should touch upon e-procurement or allow for an extension. The second sub-question then resulted in selecting three models (Cousins et al. (2006), Paulraj et al. (2006), & Schiele (2007)) that remain eligible for an extension on e-procurement. The third sub-question is covered by a company analysis (*Section 4.1*) to determine the e-procurement domains and topics that must be part of the extension. Furthermore, expert interviews and internal documents should provide sufficient insight to define those identified subjects (*Section 4.2*). The fourth sub-question builds upon the interviews by extending the selected maturity model and explaining this extended instrument (*Section 5.1*). The last sub-question revolves around demonstrating how the extended maturity model should be used and evaluate the workings of the instrument (*Section 5.2 & 5.3*).

3.1.3 Research strategy

A qualitative approach was chosen to achieve the research objectives and answer the research questions. Baxter and Jack (2008) argued that qualitative research allows researchers to explore either individuals or organisations, simple and complex interventions, relationships, communities, or programs, thus, facilitating the deconstruction and subsequent reconstruction of various phenomena. The qualitative methodology consisted of multiple activities that explored the research issue from various lenses, allowing diversified facets of the phenomenon to be revealed and understood (Baxter & Jack, 2008). Therefore, this research study came with flexibility and rigour. The research strategy was divided into two segments, shown by the flow diagram of Figure 3.1. The different elements will be described and discussed in the following sections.

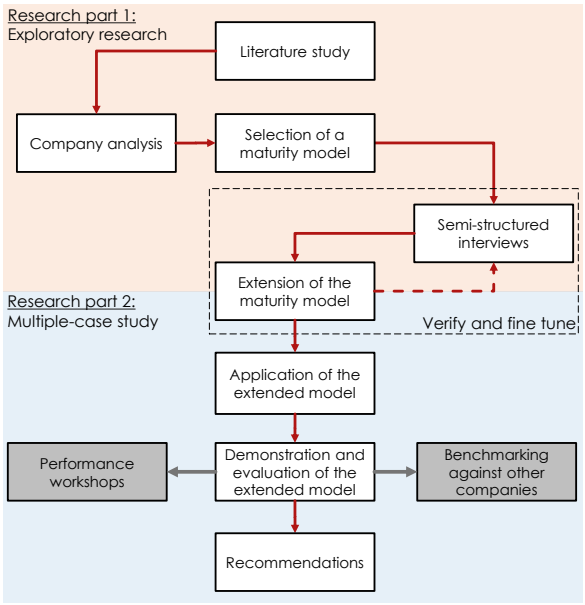

Figure 3.1: Flow diagram of the research strategy

3.2 Exploratory Research

The first segment of the research revolved around exploratory research, aiming to select and extend a suitable maturity model. Yin (2003) defined this type of case study as the opportunity to explore situations in which the phenomenon being evaluated has no clear, single set of outcomes. The exploratory research consisted of a literature review, a company analysis, semi-structured interviews and the extension of the maturity profile instrument. These activities will be described below.

3.2.1 Literature study

The former chapter provided a literature study to identify the broad problem area and scope towards a researchable topic. Preliminary research was focused on critically reviewing the literature to acquire a comprehensive overview of related works on purchasing maturity models for PSM organisations. An additional literature review was required to select several suitable frameworks and describe their relation to e-procurement as preparation for the company analysis. The choice to expand the literature is backed up by Sekaran and Bougie (2016) because it is stated that a subsequent literature review is essential to become an expert on the topic.

3.2.2 Company analysis

Connecting the literature to an organisation that practices (e-)procurement strengthens the research study. The *Corporate Group* is a major PSM organisation and has dedicated a department, the Procurement Excellence (PEx) team, to drive, execute, and improve e-procurement processes. A company analysis will be conducted to confirm the literature study's findings and identify the critical e-procurement domains for the extension. A description of the company structure is needed to explain the sheer complexity of procurement and describe the e-tools and programs in place that drive the model extension. The analysis is realised by reviewing internal documents, combined with interview findings and own observations. Thereby, it also guides the selection of a maturity model. Referring back to the requirements for selecting a suitable model, a framework must allow for an extension on e-procurement. Finally, the company analysis should provide the domains that call for addition or extension and thus, need to be further investigated through semi-structured interviews.

The *Corporate Group* consists of many companies, and one of these could be selected as a case study to allow for a demonstration and evaluation of the extension. A recently established purchasing company called *Entity A* recognises an opportunity to improve its procurement performance due to its transformation process. [1] *Entity A* consists of several business units, and they are barely using the e-procurement tools and programs provided by the PEx team. Thereby, collaboration is most likely needed to improve the situation for all involved parties. This relates back to procurement requiring an acceleration of digital transformation, which is certainly the case for *Entity A*. Conclusively, learnings on e-procurement will be taken from the *Corporate Group* to close the gap in the literature. The company analysis in Chapter 4 will continue to describe the structure and procurement process in detail. The business units of *Entity A* allow for a multiple-case study, which will be extensively described in subsection 3.3.

3.2.3 Semi-structured interviews

The semi-structured interviews are an important part of the research because key experts should confirm the findings of the company analysis and provide insight into the to-be identified e-procurement domains. The interview purpose and approach will be discussed below. The qualitative data analysis will be discussed together with the extension of the selected model.

Purpose

A proper method to gain insight into the domains of e-procurement is by conducting interviews with experts and key figures of a major PSM organisation such as the *Corporate Group*. The interviews need to ensure all the relevant functions are included in the to-be selected maturity framework or added based on the findings. Thereby, follow-up interviews are needed to verify and confirm the interview findings. Besides the inclusion of e-procurement, the selected framework should be reviewed by a procurement expert. Therefore, the interviews have two objectives: **(i)** evaluate the existing framework that has been selected, and **(ii)** to gather in-depth information about e-procurement to extend the selected model.

[1] This research report will not disclose the exact names of the organisations to protect confidential information. Therefore, "*Corporate Group*" refers to the large corporate company and "*Entity A*" to the purchasing company.

Although the following chapters will elaborate on this, several procurement directors or managers with different expertise will be interviewed at least once and followed up when feasible. One interviewee will be selected to discuss the company's procurement process to understand the relationships and review the overall framework. This needs to be an experienced procurement director leading a company to ensure all the topics can be discussed. Since the Procurement Excellence team plays a large role in identifying e-procurement domains, an interview with the PEx director will be conducted as well to discuss the to-be-determined e-procurement domains and discuss the corresponding extension structure. Furthermore, at least one interviewee should be selected per e-procurement domain and possible additional domains. In the end, seven people were interviewed that were leading the team responsible for the identified domains. Thereby, several interviewees could provide information on multiple domains at once due to their versatile background or significant experience. This should be sufficient to review the selected framework and extend it by e-procurement.

Approach
An interview structure is needed to answer a certain set of questions. Still, not all the input can be anticipated (Sekaran & Bougie, 2016). Therefore, a semi-structured interview approach is more suitable than a structured approach. This approach allows to guide the interviews in specific directions when needed but also facilitates the opportunity to divert the conversation to certain perspectives, ideas and topics that are brought up. Based on the company analysis, e-procurement domains will be determined, which will also result in the identification of appropriate interviewees. At least one expert of the *Corporate Group* will be selected per domain, but more than one if available and feasible. These experts should be experienced in their field, preferably the head of their department. An interview framework will be developed in the form of an interview outline. Appendix E shows this outline but will further be discussed in Chapter 4.

The interviews are conducted online through the use of Microsoft Teams, a business communication platform. Although face-to-face interviews were preferred, this was not feasible due to the circumstances involving COVID19. All the interviews were recorded as long as the interviewees provided permission upfront. The recordings were deleted after they served their purpose. Interviewees were selected from within the company, and the procedure complies with the TU Delft Ethics Review for Human Research, as can be seen in Appendix F. The interviews have been summarised in an anonymised format. Afterwards, a summary was sent to the interviewees for verification and possible changes and remarks. Follow-up interviews were sometimes required in case of exceeding the time and continue the discussion. The interviews' qualitative data analysis will be discussed together with the extension of the selected maturity model.

3.2.4 Extension of the selected maturity model

The selected maturity model is extended based on the findings from the literature review, company analysis and semi-structured interviews. The procurement experts will describe industry best practices to provide the foundation for the extension of e-procurement. The extended model would be presented to a few procurement experts in an ideal situation to validate and further improve. However, due to limitations, this step is skipped.

The extended instrument will be created in Microsoft Excel, shown in Appendix I, similar to the one presented in Appendix B.4. However, this version already shows a visually adapted version because it provides a better overview and appeals to the eye. A colour scheme has been used for the extension to easily distinguish the different dimensions and show the changes and additions compared to the original instrument. The extension and the summary are sent to the interviewees for verification and confirmation of the findings and extension. The final MS Excel document is then converted to a template, compatible with the internal sourcing optimisation software to easily consolidate and display the data. An example of this template is shown in Appendix J.

Qualitative data analysis
Interviews result in a lot of qualitative data. According to Sekaran and Bougie (2016), a common approach in qualitative data analysis is to follow these three steps: data reduction, data display, and drawing conclusions. However, qualitative data analysis is not a linear step by step process and usually requires going back and forth. The interview method is also less conventional because interviews guide the model extension instead of regular data analysis to explain or identify a relationship. Additionally, establishing a unit of analysis is required to analyse the data. This is the level of aggregation of the data collected during the subsequent data analysis stage (Sekaran & Bougie, 2016). The unit of analysis is the purchasing maturity because it is the unit that the model needs to measure. However, the interviews do not directly observe this concept, and a unit of observation should be selected for the interviews. A unit of observation includes the items that are actually observed, measured, or collected. Since each interview is focused on a particular domain, the corresponding purchasing functions are selected as the unit of observation. The three steps of qualitative data analysis will be described below.

1. **Data reduction**. Data reduction refers to the process of coding and categorising data (Sekaran & Bougie, 2016). The interviews serve the purpose to gain insight into certain domains by talking to the experts within a large PSM organisation performing in e-procurement. A single person then provides the data to describe the purchasing functions and extend the model for each domain. There is no need to compare interview results due to the difference in interview topics. Therefore, the interviews are immediately and simultaneously summarised and coded. However, the presence of groups and codes in the interviews is tracked to find commonalities among variables to guide the extension, as is shown in Appendix H. This will be further discussed upon in Chapter 4. The summaries are categorised per purchasing function. Interviews are not transcribed to simplify the process while preventing the loss of crucial information.

2. **Data display**. Secondly, data display involves taking the reduced data and display it in an organised but condensed manner (Sekaran & Bougie, 2016). Graphs and diagrams assist in organising the data to discover patterns and relationships. These visualisations then facilitate the process of concluding. However, this would mostly apply to the maturity assessments where quantifiable qualitative data was analysed and displayed. The domains are extended by using the purchasing functions and corresponding stage descriptions from the interviews, internal documents and the experience obtained from the company. The summary and domain extension are sent to each interviewee to verify and confirm the authenticity and accuracy.

3. **Drawing conclusions**. The third step is drawing conclusions. This is the essence of the analysis because it provides explanations for observed relationships and patterns (Sekaran & Bougie, 2016). In the case of the model extension, interview findings are combined with the literature study, company analysis and internal documents to extended the selected model. A multiple-case study is needed to determine whether the extended model measures what it intends to measure.

3.3 Multiple-Case Study

The second segment focuses on applying, demonstrating and evaluating the extended model and is considered to be a multiple-case study because of *Entity A*'s various business units. Yin (2003) argued this approach is reliable, robust and enables the researcher to explore differences within and between cases. A multiple-case study is suitable to draw comparisons between the different business units of *Entity A* and ultimately determine the performance of the extended model. This section will first describe the company profile of *Entity A* and the purpose of the multiple-case study. Furthermore, the case study selection will be described and supported by propositions. Finally, the research methodology of maturity assessments will be provided.

3.3.1 Purpose of the multiple-case study

Entity A consists of several semi-independent Operating Companies (OpCos), distributed over four business units. The company structure has shifted to a more centralised structure while also being part of the major organisation of the *Corporate Group*. There have not been significant organisational changes since the OpCos' acquisitions, and it is most likely that the purchasing maturity of the business units will differ significantly. The OpCos specialise in supplying high-quality products for a Business-to-Business (B2B) industry, where the purchasing activities are supported by e-tools provided by the PEx team. The relationship can be described as a collaboration between a corporate Centre of Excellence (CoE), semi-centralised business units, and decentralised OpCos on the periphery. This demonstrates the high complexity, which can be considered a hybrid structure due to different (de)centralisation levels (Bals et al., 2018). However, the literature of maturity models did not distinguish between different levels of (de)centralisation.

Entity A was chosen for the multiple-case study because of various complementary reasons that strengthen each other. It consists of multiple companies in the same industry, thus enabling a mutual comparison without interfering factors. This is required for a series of replicated case studies (Yin, 2003). Thereby, the OpCos are supported by a department dedicated to e-procurement. This provides a proper link between the model extension and the maturity assessments but also ensures e-procurement maturity can be measured in the first place. *Entity A*'s transformation process ensures the willingness to cooperate and, due to the expectation of different maturity levels, provides an interesting opportunity for the research study.

The extended model will be demonstrated by applying it to a procurement organisation to assess the purchasing maturity and evaluate the workings of the extension. A suitable approach is required to measure the business units' purchasing maturity, and the literature study provided the foundation for this. The application of the extended model should allow for the measurement and enhancement of the purchasing maturity of *Entity A*'s business units. However, it is required to demonstrate whether the model actually measures what it intends to measure. Therefore, the multiple-case study primarily serves the purpose of evaluating the extension. Besides *Entity A* providing this opportunity, it will also be a proper source of information. The extension will be mainly achieved through the use of knowledge provided by the *Corporate Group* and thus, the extended model is not necessarily limited to *Entity A*. It should be applicable to all companies of the *Corporate Group*. The selection of the cases within *Entity A* for the multiple-case study will be explained in the next subsection.

3.3.2 Case study selection

Entity A consists of four business units, which will be labelled as A, B, C & D. Each unit consists of multiple OpCos, distributed over various sub-units. The model should be demonstrated by applying it to OpCos that cover a large part of *Entity A*'s value to evaluate the extended model. Therefore, for each business unit, the two OpCos with the largest spend are selected. The value of the eight OpCos is more than 80% of *Entity A*'s spend. The OpCos of A & B will be from the same sub-unit while the OpCos from C & D are from different sub-units to ensure variety and enable evaluation on three different levels (OpCo, sub-unit, and business unit). Thereby, this approach will also contribute to the generalisability of the research study, which will be further discussed in Section 3.4.

According to Yin (2003), propositions are helpful in case studies to increase the likelihood that the research study will operate within the scope. Several strategies are feasible, but developing a case description that details the evidence and its context is most suitable for this research study. The case description enables the identification of explanations that require analysis or evaluation. Three propositions can be formulated to evaluate the extended model. When the discussion in Chapter 5 returns to the propositions, it guarantees the evaluation will be focused on the initial intentions and prevents any temptation to analyse data outside of the scope.

Proposition One: *"The overall maturity of the four business units is decreasing in the following order: A, D, then C, and B should be the lowest."*

This statement was formulated based on the vision of *Entity A*'s procurement director. Purchasing maturity depends on many factors, but is largely affected by the available resources and level of centralisation. A more detailed description of the business units will be provided in Chapter 4. If the proposition cannot be accepted, either the resources and level of centralisation are less important or the model and the assessment approach fail to deliver.

Proposition Two: "*The difference in maturity is likely lower for OpCos of the same sub-unit opposed to OpCos in different sub-units.*"

This proposition is connected to the first one, but evaluates the results on a deeper level. OpCos from the same sub-unit are most likely centrally managed, while not necessarily the case for OpCos of different sub-units. If the proposition cannot be accepted, centralisation is less effective than assumed.

Proposition Three: "*OpCos with a higher overall maturity should score higher on the e-procurement dimension, but the Entity A's overall maturity on e-procurement should not exceed beyond stage 2.*"

This statement links to absorptive capacity and the second part of the proposition was also formulated based on the vision of *Entity A*'s procurement director. *Entity A* is not experienced in e-procurement which is well-known within the *Corporate Group*. If the proposition cannot be accepted, the extension would be probably insufficient or inaccurate.

3.3.3 Maturity assessments

Cousins et al. (2006) and Paulraj et al. (2006) did not disclose the research methodology of the maturity assessments, while Schiele (2007) argued for two methods to measure purchasing maturity. The first is to ask a firm to score their use of suggested tools, methods and approaches. The second is to conduct third-party purchasing audits. Schiele (2007) went with the latter and audited 14 firms to an extensive length. The firms were all from the same industry, and therefore, cross-industry factors were excluded to ensure results were because of inter-firm differences.

The option of Schiele to conduct purchasing audits by third parties is not feasible. Therefore, this research makes use of the extended maturity instrument to ask the OpCos to score their maturity. Assessors are selected for each business unit or OpCo, and they have received the extended model upfront. The assessors provide the appropriate stage levels for the purchasing functions in an online session of 60 to 90 minutes. This approach is chosen to clarify certain maturity questions and check whether they correctly understood what was asked. Although third-party audits would remove any bias, the sessions are also used to reduce some bias by critically question why each stage level was provided. However, it is expected some bias would remain. Therefore, the results are discussed with the procurement director to evaluate findings. Since *Entity A*'s OpCos are all from the same industry, it is ensured that the results are because of inter-firm differences. Future research could expand this multiple-case study by assessing more companies within the *Corporate Group* since they are also operating in the same industry.

Quantifiable qualitative data analysis

The company analysis in Chapter 4 shows the company structure of the *Corporate Group* and *Entity A*. Basically, to determine the purchasing maturity of *Entity A*'s organisation, the levels have to be determined for the business units by assessing sub-units and OpCos. The unit of analysis remains the purchasing maturity, but the unit of observation is, therefore, the different OpCos. As opposed to the interviews, the maturity assessments result in quantifiable qualitative data. The qualitative data analysis will be described below and is applied within Chapter 5.

1. **Data reduction**. Assessors provide the stage levels for each purchasing function. The data is put into the aforementioned template to consolidate and display the data easily. Some of the data, such as OpCo names and business units, have to be anonymised to be included in this research study.
2. **Data display**. Advanced MS Excel reports are easily created due to the template and internal sourcing optimisation software. Purchasing functions are assigned personalised tags to display data on an OpCo, sub-unit, business unit, or *Entity A* level.
3. **Drawing conclusions**. The different OpCos and business units will be compared to find commonalities and data outliers. The analysis will return to the propositions to remain within the research scope. The propositions were formulated based on the input of the procurement director to determine the assessment's level of bias. The findings are used to evaluate the extended model.

The extended instrument will be demonstrated by displaying data results to review the assessment results and evaluate the extended model. The results should provide the purchasing maturity levels per OpCo, business units, and *Entity A*'s entire organisation. The stage descriptions will then show how certain functions can be improved.

3.4 Research Validity and Reliability

Qualitative research requires the verification of conclusions drawn from data (Sekaran & Bougie, 2016). It must be ensured that derived conclusions are plausible reliable and valid. However, validity and reliability have a slightly different meaning in qualitative research compared to quantitative research. Gibbert et al. (2008) constructed a framework for case studies to ensure methodological rigour by touching upon validity and reliability. The framework is slightly adapted to cover the entire research approach by including additional types of validity. The adapted framework is shown on the next page in Table 3.1.

The adapted framework covers four types of validity and reliability. Validity refers to the extent to which the research results: **(i)** accurately represent the collected data (internal validity), and **(ii)** can be generalised to other contexts or settings (external validity) (Sekaran & Bougie, 2016). Since an existing instrument will be extended and subsequently demonstrated, additional types of validity have to be taken into account: content validity and construct validity. Content validity relates to the extent to how adequately the instrument measures or represents the concept of interest (Sekaran & Bougie, 2016). Construct validity refers to the extent to which a procedure leads to an accurate and intended observation of reality (Gibbert et al., 2008). Finally, reliability refers to the absence of random error. Meaning, subsequent researchers should arrive at the same insights if they follow the research methodology.

The next chapter will analyse the company structure, select a maturity model, and provide an extension according to this research methodology. The model will be purely an extension of the selected maturity model and cannot be considered a new maturity model. A limitation of the research is the expectation that the extended model is primarily tailored to *Entity A*. However, the model is likely applicable to other firms of the *Corporate Group* as well.

Table 3.1: An adapted reliability and validity approach based on the framework of Gibbert et al. (2008)

Topic	Implementation
Internal validity	Research framework: The research framework was explicitly derived from PSM literature, see Section 3.1, 3.2 & 3.3.
	Theory triangulation: Several different theoretical lenses and bodies of literature were used to develop the research framework.
	Pattern matching: The interview findings have been compared to the findings from the company analysis and internal documentation. The model is extended based on the inclusion of groups and codes.
Content validity	Subject matter expert review: Experts in e-procurement were interviewed to describe industry best practices.
	Connecting literature and practice: Literature and interview findings were compared and matched to extend the maturity instrument.
Construct validity	Data triangulation: Various sources of data were used: interviews, internal documents, and direct observations by the researcher.
	Clear chain of evidence: Interviewees confirmed the correctness of interview summaries and extended domains. They proposed amendments if and where needed. The assessors provided the stage levels themselves.
	Explanation of data analysis: The qualitative data analysis approach for the interviews and the approach for quantifiable qualitative data analysis of the maturity assessments were explained and justified.
	Critical assessments: Maturity assessments were conducted with a critical mindset. However, third-party audits would have even ensured less bias.
External validity	Cross-case analysis: The multiple-case study revolved around the four business units of *Entity A*, each consisting of multiple operating companies. It served the purpose of demonstrating and evaluating the extension.
	Rationale for case study selection: The reasoning behind selecting a multiple-case study approach was clarified in the former subsections.
Reliability	Case study protocol: All cases were treated equally. A standard interview outline provided consistency in questioning. Interviewees and assessors were all provided with the same level of information.
	Case study database: A clear database has been constructed, containing interview summaries and internal documents. However, recordings had to be deleted, transcriptions were not made, and cases were anonymised.

Chapter 4: E-Procurement Analysis

This chapter will provide a company analysis on the *Corporate Group* and *Entity A* with the purpose of identifying critical e-procurement domains, interview topics and subsequently selecting the most suitable model. Thereafter, interviews will be conducted with procurement experts to review the framework of the selected model and acquire insight into the identified e-procurement domains. The interview findings will be described and compared to the literature and internal documentation. The chapter will be complemented with an overall conclusion on the analysis.

4.1 Company Analysis

The priorities of PSM organisations at the time of developing maturity models are similar to today's priorities. However, the means have expanded through digital developments, and thus, the assessment should expand as well. The company structure of the *Corporate Group* and the cross-functional integration with *Entity A* are key for analysing the vital procurement processes and corresponding tools and programs. The company analysis enables the identification of e-procurement topics of interest to conduct interviews, and subsequently the selection of a suitable maturity model, and finally provides information to carry out a multiple-case study. This section will first describe the structure of the *Corporate Group* and *Entity A*. Subsequently, the organisational structure and key aspects will be touched upon. Thereafter, the procurement process will be described and analysed. Finally, the e-procurement domains will be focused on.

4.1.1 Company structure

The *Corporate Group* operates on a global scale and is a leading company in its industry. The scope of operation covers several continents whereby the products can be found in all facets of the business. A substantial part of the *Corporate Group*'s approach is based on the Mergers and Acquisitions (M&A) strategy, meaning they acquire and sell operating companies. Although the strategy focuses on improving financial performance or reducing risk, it also affects the complexity of the company structure. In order to ensure clarity to both employees as well as business relations, the *Corporate Group* is divided into several divisions and clusters.

Entity A belongs to the *Corporate Group* and is further divided into four business units. Each business unit is divided into sub-units, consisting of several operating companies. Although the business units could have similar maturity levels, the OpCos' maturity levels likely differ due to various conditions (i.e. different levels of centralisation, management styles, capacity, resources, etc.). This research study primarily focuses on the measurement and improvement of maturity, but the conditions should be taken into account. The four business units need to be assessed to determine the purchasing maturity of *Entity A*, enabling a demonstration and evaluation of the extension. *Entity A* also collaborates with the Procurement Excellence team and many business categories. This will be further explained in the organisational structure.

Business unit descriptions

There could be various explanations for the difference in purchasing maturity. Unit characteristics will provide background information to discuss the maturity assessment results in the next chapter and are linked to the propositions.

- **Business unit A**: The spend is 38% of *Entity A*'s total. Thereby, this unit has the most resources, expressed in Full-time Equivalent (FTE). Activities and responsibilities are centralised for most of the OpCos. The two selected OpCos are within the same sub-unit and thus, coded A1-I and A1-II. Maturity levels are expected to be similar.
- **Business unit B**: Although 24% of the total spend, this unit has the least resources regarding FTE. Management is currently centralising several processes. The two selected OpCos are within the same sub-unit and thus, coded B1-I and B1-II. Maturity levels are expected to be similar but slightly different due to the ongoing centralisation process.

- **Business unit C**: The spend is with 23% a bit lower than Unit B, but there are more resources available (on average). No centralisation has taken place yet. The two selected OpCos are not within the same sub-unit and thus, coded C1-I and C2-I. The difference in the level of maturity is expected to be higher because of high decentralisation.
- **Business unit D**: The spend is 15% of the total, thus the smallest unit of the four. The number of FTE is on average while most of the companies are already centralised. The two selected OpCos are not within the same sub-unit and thus, coded D1-I and D2-I. The difference in the level of maturity is expected to be higher because of high decentralisation.

4.1.2 Organisational procurement structure

The *Corporate Group*'s organisational structure and its relation to *Entity A* are highly relevant for extending the maturity profile instrument. The corporate procurement department is mostly driving e-procurement. Thereby, the organisation is quite complex due to its size and structure. By describing the organisational structure, the complexity will hopefully be reduced for the reader, especially those without prior knowledge of procurement.

There is an important dynamic between the *Corporate Group*'s corporate layer and the underlying departments and companies because of its cross-functionality. More than 600 people support the business by helping with procurement activities and improving processes through digital transformation. Recently, category management has been introduced with an active focus on change management by providing support from the centre on e-procurement. Even though the main focus is on e-procurement, it would be beneficial to the extension to further understand the organisation by describing cross-functional elements and the use of category and change management. Therefore, these descriptions are provided in Appendix D.

The procurement department, better known as the PEx team, operates on a corporate level and is the main driver of digital procurement. The procurement activities are connected to all the different divisions and entities. The PEx team pushes for industry best practices and has a significant impact on the performance of the entire company and, thus, on *Entity A*'s performance as well. However, this mostly depends on the interaction between the organisations and whether the *Corporate Group*'s resources are optimally used. An organisational chart of the *Corporate Group* PEx department is shown in Figure 4.1. In order to effectively support the purchasing teams' activities, the team is divided into several sub-teams.

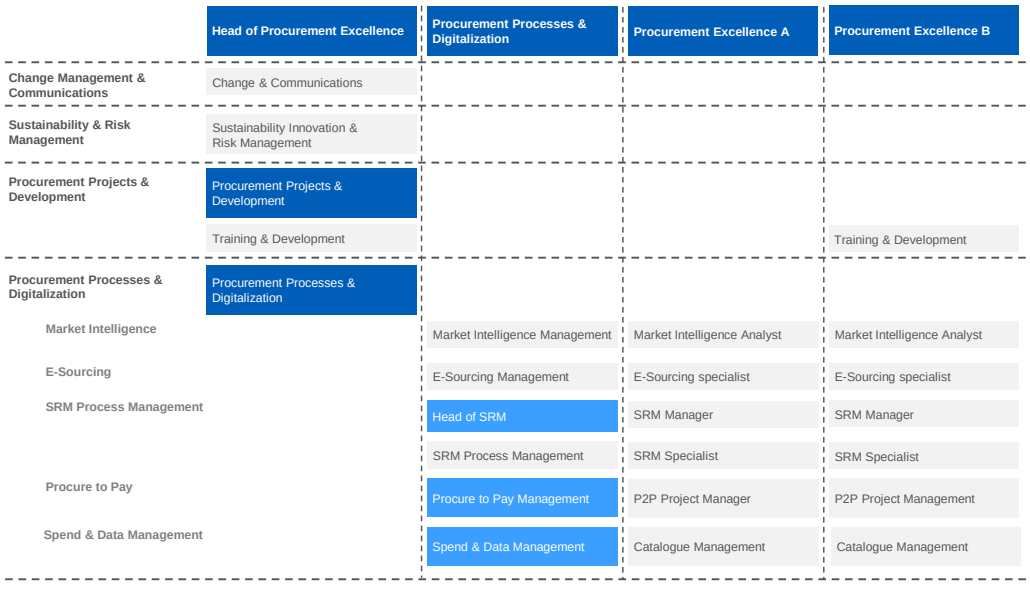

Figure 4.1: Organisational chart of the *Corporate Group* PEx department (Corporate Group, 2021)

The procurement team mainly focuses on supporting and optimising the processes of purchasing materials and services. However, the activities are not solely limited to driving improvement within purchasing. The team is also keeping track of sustainability targets, facilitating the digitalisation processes, and providing training for personal development. PEx also acquires and introduces the latest e-tools and programs. The success of these improvements depends on the adoption by the different OpCos and the communication between the involved parties. Vice versa, communication and the level of adoption are also indicators for an OpCo's maturity.

4.1.3 Procurement process

The structure and main elements of the PEx department have been described to provide insight into possible aspects that are key to the assessment of e-procurement maturity. The next step is to describe the procurement process and the involvement of the PEx teams.

The backbone of procurement

Kraljic (1983) already argued in 1983 that purchasing must become supply management. Kraljic defined the four stages of purchasing sophistication and described how companies should shape their supply strategy. Purchasing companies must comprehend the risks and complexity of global sourcing to ensure the long-term availability of critical materials and components at a competitive cost. Simply monitoring current developments won't be sufficient, and instead, management must change the company's perspective from purchasing (an operating function) to supply management (a strategic function). This idea shows similarities with the views posed in the aforementioned subsection 4.1.2.

Supply management becomes increasingly more important in the case of greater uncertainty of supplier relationships, technological developments, and the physical availability of items. It was almost four decades ago, but the idea still largely applies to contemporary organisations and their purchasing processes. A company's need for a supply strategy according to Kraljic (1983) can generally be broken down into the following two factors:

1. The strategic importance of purchasing in terms of the value added by the product line, the percentage of raw materials in total costs and their impact on profitability.
2. The complexity of the supply market is gauged by supply scarcity, the pace of technology and materials substitution, entry barriers, logistics cost and complexity, and monopoly or oligopoly conditions.

When senior management assesses the company's situation in terms of these two variables, a company can determine the right supply strategy to exploit its purchasing power towards suppliers and reduce its risks to an acceptable minimum. Schiele (2007) argued that the organisational structure should be a dimension in the maturity profile by adopting a managerial approach, which is actually an attempt to respond to Kraljic (1983) and its statement that purchasing must become supply management. It once again shows the large influence of Kraljic's concept on contemporary procurement organisations. Cousins et al. (2006) and Paulraj et al. (2006) on the other hand, barely touch upon the effect of organisational structure.

The Corporate Group's procurement process

The *Corporate Group*'s procurement process will provide insight into e-procurement and which topics should be touched upon in the maturity profile. The key components of this process will then be used to further extend one of the three models to fully cover the profile of e-procurement. A process description will be provided based on internal documents and complemented by the interviews shown in Appendix G.

The purchasing process of the *Corporate Group* is shown in Figure 4.2, which resembles the typical process for procurement departments. However, each purchasing organisation has a different combination of teams and tools that are in place to cover the various procurement functions.

The process is infinite due to the repetition of the steps, but it is stated that the process starts and ends with Contract Management & Analytics and Spend Transparency (Klarnskou, 2021). The process can be divided into a tactical part and an operational part.

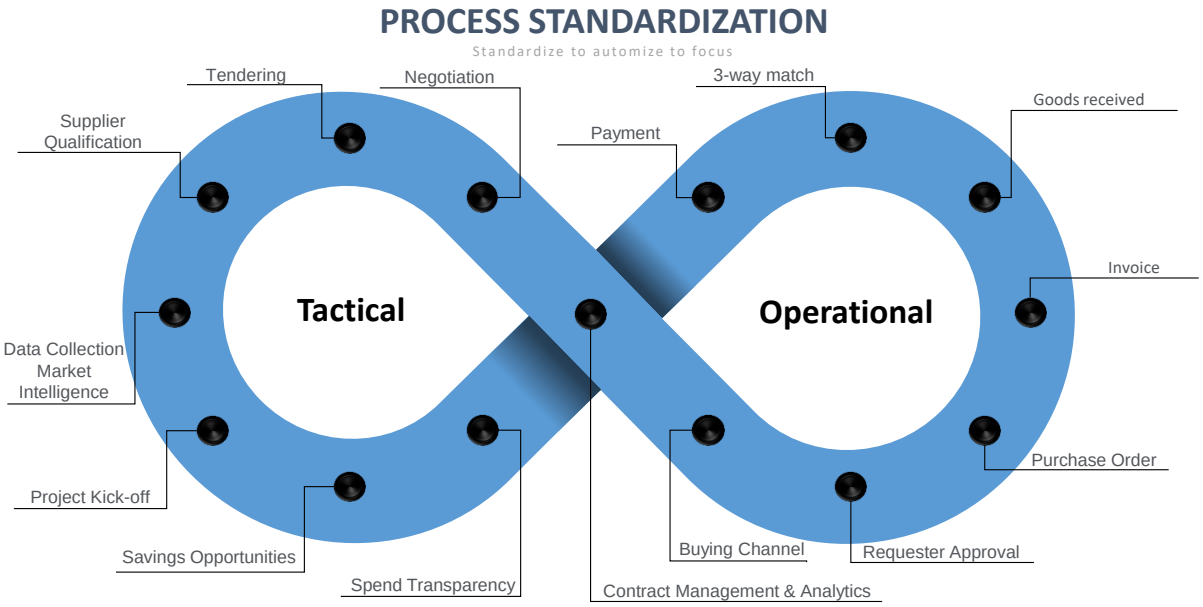

Figure 4.2: Standardisation of the *Corporate Group* procurement process according to Klarnskou (2021)

Tactical. Contract management & analytics promotes compliance with current contracts and also provides new business opportunities. The Spend & Data (S&D) Management team simultaneously ensures a transparent overview that enables spend analytics to identify certain savings opportunities. The business categories will kick off projects based on these opportunities. The Market Intelligence (MI) team will then support the categories by collecting and providing market data (e.g. commodity prices, market developments). Based on these insights, suppliers will be selected for tendering. The E-Sourcing team facilitates a platform and offers supportive e-auctions to decrease the spread in supplier pricing. The tender process completes with final negotiations between the business side and the supplier(s), which will be then put into word and writing (contract). The contract will be processed, managed, and accordingly, the agreements will be fulfilled. This is also the transition from the tactical part to the operational part.

Operational. The operational part of the procurement process is covered by the P2P team. Buying channels are chosen to buy products via either a certain catalogue or supplier, and corresponding to this is an approval flow, depending on the product and price. A purchase order will be created after approval, and the *Corporate Group* will commit to the spend of the purchase. The supplier will send an invoice, and the goods/services will be received. When the purchase order, invoice and received goods/services show a 3-way match, payment will be issued. The payment will then be processed in the contract management tool and affect the spend management.

The visualisation is a good representation of the procurement process. However, the SRM team is not fully represented in the visualisation of the process. Although contract management and P2P are part of the team, SRM is also responsible for risk management, supplier optimisation, and supplier relationship management. Therefore, it should be taken into account as well when reviewing the e-procurement tools and programs. Nonetheless, the visualisation enables to pinpoint and describe e-procurement in the company. The next subsection discusses the most important e-procurement domains in the purchasing process.

4.1.4 E-procurement domains

A system or an e-tool supports each step that is described in the former subsection. Besides facilitating a function of the procurement process, accompanied data is also created, stored and analysed, which results in further development of the procurement organisation. Organisations have the choice to decide between *One Suite* or *Best of Breed* (Klarnskou, 2021). One suite is definitely not going to fit a company's needs 100%, but it is a good way to push all standard processes into one tool and keep the data together. There will always be other tools that are separate from the one suite that you anyway need to connect.

The *Corporate Group* has chosen the best of breed approach, which shows the aim for industry best practices. This ensures the leading technology currently available for each activity. Thereby, it keeps employees on their toes as it is required to understand the currently being developed technologies. Naturally, it is much easier to change one tool in one process than an entire suite. Once again, this approach is two-sided:

- **From a strategical perspective**, it is important that the corporate layer provides the right tools to employees and puts initiatives in place which enable employees to acquire the necessary capabilities. This links back to the concept of change management.
- **From an operational point of view**, after introducing and implementing a tool or technology, its success really depends on the understanding and willingness of employees on a global, regional and local level to optimally use it. Therefore, the process does not end after an introduction, but people should be enabled to embrace change.

Chapter 2 described the three pillars of e-procurement: increasing the predictiveness of S2C, automating P2P, and enabling the proactiveness of SRM. The core capabilities [1] are largely overlapping with the organisational structure and procurement process, while some of the maturing solutions are also being implemented. However, the core capabilities should be reordered and regrouped as explained below. After that, the key findings will be discussed to select the most suitable model for an extension.

1. **Spend & Data Management**: Spend analytics is enabled due to the effort of spend & data management. However, to analyse spend, the data should first be visible.
2. **Contract Management**: Contract management is partly linked to spend management and provides a clear overview of the contracts through the use of a contract management tool. Although part of SRM, it should be discussed separately due to its significance.
3. **Market Intelligence**: Market data is needed so that the categories make (better) strategic decisions. It enables them to start projects, select suppliers and work on sourcing activities. It is not mentioned as a (core) capability but certainly affects the others.
4. **E-Sourcing**: E-sourcing, e-tendering and e-auctions are all facilitated by the E-Sourcing team. A digital platform is used to interact with suppliers by sharing information and acquiring prices and specifications provided by suppliers.
5. **Transactional Procurement**: P2P is the process starting from the identification of a need and ending when the invoice is paid, and the corresponding data is available for analysis. The use of e-catalogues and e-invoicing support these steps.
6. **Supplier Relationship Management**: Supplier information management is only a part of SRM. Supplier relationship management enables an organisation to manage and improve the end-to-end process and third-party supplier base to strengthen relationships and create value.

[1] spend analytics, e-sourcing, e-catalogues, contract management, supplier information management, e-procurement, e-invoicing, and e-auctions

4.1.5 Selecting a maturity model to extend

Considering the many involved parties and various complex process components, the company analysis had to be extensively executed to acquire a clear overview and reduce complexity. The company and organisational procurement structure have been described to get an understanding of the current situation. This included a review of PEx, its main teams and a description of the procurement process. The core capabilities of e-procurement were compared to PEx's competencies to identify and describe the e-procurement domains that should be part of the extension. Even though neither of the three maturity models dived into these e-procurement topics, Schiele (2007) provided the model that shows most similarities by touching upon a variety of topics, including environment scanning (MI), sourcing, and SRM. Thereby, it is the most comprehensive framework, and the stage descriptions provide great value in providing guidance in improving certain purchasing functions. Cousins et al. (2006) provided the most basic model while Paulraj et al. (2006) primarily focused on strategic purchasing. Both models lack guidance in change management, nor is there much overlap with e-procurement. Therefore, the model of Schiele (2007) is most suitable for an extension on e-procurement.

The six domains also have formed the basis for the interviews. The PEx domains seem to have a great impact on the maturity of companies. From a management perspective, it appears there is a drive to improve procurement through digitalisation and innovation. Preliminary research had already pointed out that maturity improvement is mostly possible due to technological development and innovation. However, it does not necessarily mean that developing and acquiring new tools will increase and maximise maturity. Technology is rarely self-contained, and as a result, it has to be taken into account that the organisational, structure, strategy, technology and purchasing capabilities go hand in hand. Therefore, the maturity instrument should not necessarily assess the adoption of the different tools but instead include their usage as different maturity stages. The focus will be on the most relevant purchasing functions of e-procurement in the six domains. Incorporating the domains in the maturity instrument should be done to match the interview findings but still could apply to other companies.

4.2 Interview Findings

Semi-structured interviews were conducted to assess the maturity instrument of Schiele (2007) and determine possible extension areas within each identified domain. Even though the main focus of this research was on embedding e-procurement, the entire framework was evaluated first by interviewing a procurement expert to improve the quality. The interviews were arranged based on the results from the literature study in Chapter 2 and the research approach described in Chapter 3. Appendix E shows the interview outline with the following topics: explanation, introduction, definitions & process description, framework, functions & stages, and synopsis. There was also a verification step after processing the interviews. The interview summaries are shown in Appendix G.

4.2.1 Review of the instrument's framework

Schiele's model is divided into five dimensions. These were shown and explained to the interviewee in a first session, and the existing model was sent to read through it. The entire model was discussed in a second session. The interview summary is shown in Appendix G.1 and the key findings are described below. Additionally, direct and indirect procurement was touched upon.

Review of the five dimensions

A procurement expert of *Entity A* was interviewed to review the framework of the maturity instrument. This also led to the interview with an indirect spend manager.

1. Procurement Planning (PL)
The interviewee proposed to remove several functions in the first dimension. This would make the model more fitting to *Entity A*, but it would be more difficult to apply to other firms. Therefore, the changes were not considered to be taken into account. However, the interviewee confirmed the purchasing functions are still applicable and not missing a certain aspect.

2. Organisational Structure of Purchasing (OS)
The functions in the organisational structure of purchasing were considered to be very relevant. However, the interviewee proposed to add another function regarding direct and indirect procurement. This would not necessarily be part of one of the six domains but still part of the framework review. A separate interview was scheduled with an indirect spend manager, which is described after reviewing the five dimensions. Furthermore, the interviewee was missing a split between strategic/tactical purchasing and transactional purchasing. The procurement process is divided into these two categories, as has been described in the main text. This supported the decision to create the six separate domains.

3. Process Organisation (PO)
The functions in the third dimension were covering the dimension, but the interviewee proposed several adjustments. The first function, "sourcing strategy" from Strategic Sourcing (PO1), was rather vague. The interviewee argued there is not just one sourcing strategy, and asking how the company strategy can be described would not match reality. It required to be rewritten to match with the tactical part of procurement and the corporate sourcing department. The interviewee proposed redefining the question to "How is the sourcing strategy determined?". Changing the question was considered an improvement, but the stage descriptions were left untouched because the extension domain e-sourcing would further elaborate on the sourcing strategy. However, the fourth stage contained the following sentence: "Key issues of the competitors' sourcing strategies are known and documented". This was removed based on the interviewee's opinion since it is impossible to have that kind of information, or it would bring along compliance issues.

Furthermore, it was proposed to remove the "contract management" function. According to the interviewee, this is in the focus of the central team and therefore not applicable for *Entity A*. However, every company should manage their contracts. Although there will be an extended domain, it should remain in the generic part of the model. The same applies to the function "involvement marketing". The interviewee proposed to delete this function, but this was disregarded since it does affect the maturity of a company.

4. Human resources and leadership in procurement (HR)
The interviewee found the fourth dimension regarding human resources and leadership in procurement (HR) most problematic because it does not relate specifically to purchasing activities. It was considered quite generic and could apply to all departments without being too different from each other. According to the interviewee, it should be taken out completely to reduce complexity, given its low impact on the maturity assessment. However, the interviewee acknowledged the answers probably could differ per unit within *Entity A*. In order to still assess the maturity of the HR dimension but reduce the complexity of the model, the interviewee proposed to take out the following domains and functions: the domain Personnel selection and integration (HR2) and the function "career development" within Performance appraisal & Career development (HR3). Hiring the right people and their personal development process definitely affects purchasing maturity, so this feedback was disregarded.

5. Purchasing Controlling (CO)
The fifth dimension was considered relevant, besides the functions "organisational structure" and "measurement controlling process" within the second domain of Controlling process & Structure (CO2). The interviewee considered these functions to be obsolete and vague. However, specifying these functions would reduce the generalisability of the model, and the feedback was disregarded.

Overall results of the review
The framework review resulted in small adjustments, but some feedback has been disregarded because it would make the generic part of the model too tailored to *Entity A*. However, the interview pinpointed no domain included that focuses on the difference between direct and indirect procurement. This would be different from the spend & data management proposed for the extension, which focuses on e-procurement. Therefore, an interview was scheduled with the indirect spend manager of *Entity A*, which is discussed next.

Furthermore, it was decided to create a sixth category called E-Procurement (EP). The interviewee identified certain functions that are the responsibility of the PEx team. However, this does not necessarily have to apply to other companies. The original five dimensions focus on several different procurement processes but do not include the assessment of digital capabilities. A sixth dimension focusing on e-procurement will be complementary to the original five and show the maturity of a company on its digital processes.

Direct and indirect procurement
The interview about the framework pinpointed direct and indirect procurement were not included in the model. Therefore, an interview was scheduled with the indirect spend manager of *Entity A* to determine whether it should be part of the extension. The interview summary is shown in Appendix G.2 and the key findings are described below.

Based on the interview, direct and indirect procurement are defined as follows:

- Direct procurement: the sourcing of all goods and services that are directly related to the manufacturing of the sales product (e.g. raw materials, semi-finished products.
- Indirect procurement: the sourcing of all goods and services that do not directly go into a product or the production process but enable a business to maintain and develop its operations (e.g. operating expenses, travel costs).

Generally, direct procurement teams are centralised, have to manage inventory effectively, and they tend to foster long-term collaborative relationships with their suppliers Ghatge, Ibáñez, Khushalani, Spiller, and Teixeira (2020). Indirect procurement teams are more decentralised, predominantly focus on the company spend management, and tend to have a transactional relationship with their suppliers. Thereby, inventory management does not apply to indirect procurement. Indirect procurement can benefit from the P2P capabilities of a company, with as greatest example e-catalogues. Based on this, companies must distinguish between direct and indirect spend because they require a different approach.

The dimension organisational structure of purchasing would be the best fit to include such an assessment. The interviewee was asked which key functions should be included in the assessment of spend management and the corresponding questions and stages. The following four functions should cover the domain: understanding and awareness, communication and responsibility, purchasing process, and approach. The stages and descriptions can be found in the interview summary.

4.2.2 E-procurement domains

The six identified domains from Section 4.1 were partially confirmed in the framework review. However, a procurement excellence expert was interviewed to validate the findings. The description of the six domains follows the validation.

Validation of the e-procurement dimension
The summary of the interview with the PEx expert is shown in Appendix G.3. Initially, two additional dimensions were created, Procurement Excellence and Procurement Technology. The interviewee proposed to merge these two because it matches the organisational setup, plus it

would be difficult to distinguish between excellence and technology. Each PEx team should then represent a domain in the model, matching earlier findings. Additionally, the interviewee proposed to add the function of change management, which plays a big part in purchasing maturity. However, this would be difficult because it is not a standalone concept. Therefore, the aim was to use it for the stage descriptions just as category management and cross-functionality.

Discussing the e-procurement domains
Individual interviews were conducted to shape the six e-procurement domains. A concise summary of the findings will be provided here. If existing functions in the generic part of the model matched the interview topic, these would be shown to the interviewee for verification. Interviewees were asked to describe industry best practices for stage 4, which were not always available at the *Corporate Group*. This was done to ensure the model would go beyond the capabilities of the company. The model will be extended in the next chapter.

Spend & Data Management
Learnings were drawn from Appendix G.5. Spend & data management can be divided into three main activities:

- Data gathering: Data is gathered from a complex IT environment, consisting of many Enterprise Resource Planning (ERP) systems and tools that impact the procurement process. Ideally, the data is brought together in a (digital) central environment, called the Procurement Data Warehouse (PDW), at a frequency that is dependent on the reporting needs from the business side.
- Data enrichment & refinement: The gathered data should be put into the right format and enriched through configuration and definition to ensure consistency and enable data comparison. Enrichment means the data that is available after the automated process is executed, and refinement is the process of increasing the data quality.
- Reporting & Analytics: Data analytics is possible after data enrichment. Great examples are data visualisation, standard dashboards, data mining, and data export. Data is more valuable if it is properly enriched. The PDW should enable a clear and consistent overview, but it is up to the people to identify opportunities, acquire new insights, and better decision-making.

These three activities were also taken as the purchasing functions to cover the domain. Corresponding questions and stages were provided as well.

Contract Management
Learnings were drawn from Appendix G.6. Contract management is a part of SRM and largely connects to P2P. It has a two-folded purpose:

- Provide a repository: Contracts should be gathered, signed, approved, and stored in a repository to maintain them. Reportable fields should provide an understanding of the contents of the contract and corresponding spend. Category teams should plan and arrange new contracts with either incumbent or new suppliers (renegotiation, renewal or e-sourcing).
- Enable an authorisation and review process: Contract should be reviewed to see who is in charge, determine the budget owner and procurement approver to approve and sign the contract.

The following three purchasing functions should cover the domain: standardisation, contract adoption & compliance, and contract analytics. Corresponding questions and stages were provided as well.

Market Intelligence
Learnings were drawn from Appendix G.7. The MI team mainly supports the category teams by providing sufficient and insightful information for them to make better strategic decisions and perform sourcing activities based on the MI data. MI provides the following services and offerings:

- Reoccurring reports: General reports are sent weekly and monthly, containing hard data to update the categories and other departments.
- Deep dives: Analysis of a (sub)category or commodity group to describe a market; look into the suppliers; show price and demand trends; or define product specifications and corresponding costs.
- Cost modelling: A driver analysis to look beyond the product price and focuses on the Total Cost of Ownership (TCO) structure. This includes services and products such as transport costs and raw material costs to determine the total value of the end-product.
- Subscriptions: A collection of third-party suppliers providing commodity and other MI data.
- Platform: A free-to-use, 24/7 available self-service platform containing on-demand procurement intelligence data.

These offerings can be grouped into the following two purchasing functions: market analytics and communication and adoption. Corresponding questions and stages were provided as well.

E-Sourcing
Learnings were drawn from Appendix G.4. Sourcing is focused on consolidating and controlling all spending from the source to pay process. E-Sourcing is the digitalisation process of sourcing activities. A platform is used to interact with suppliers by sharing information and acquiring prices and specifications provided by suppliers. Since sourcing is a broad topic, opposed to describing its main activities, the different purchasing functions were discussed in detail. The following purchasing functions were defined: sourcing capabilities, organisational structure, e-sourcing strategy. Corresponding questions and stages were provided as well.

Transactional Procurement
Learnings were drawn from Appendix G.8. P2P is the process starting from the identification of a need (service or product) and ending when the invoice is paid, and the corresponding data is available (PDW) for analysis. This includes everything in between, such as the order process via paper, telephone or a system; the execution and delivery of the product or service; and receiving the order. It is important that, in the end, the invoice data is used to maximise the opportunity for future tenders.

Supporting the process, an e-P2P tool could enable maximisation of spend under management and acquires full spend visibility and control. Thereby, it should provide a "consumer e-commerce shopping" procurement experience. It guides employees through the buying process and provides a comparison across all suppliers and catalogues. A central contract repository and approval flows will ensure a straightforward and transparent process by connecting to contract management. Finally, invoice processing should become more efficient, more accurate and more timely. The following purchasing functions were defined: as-is situation, quality and availability of P2P data, and P2P metrics and reporting. Corresponding questions and stages were provided as well.

Supplier Relationship management
Learnings were drawn from Appendix G.9. Supplier relationship management enables an organisation to manage and improve the end-to-end process and third-party supplier base to strengthen relationships and create value. SRM can be divided into the following four pillars:

1. Risk management: It is imperative to determine the (potential) supplier risks and subsequently decide on actions to reduce the impact of those identified risks.
2. Contract management: This involves a contract repository plus the assurance purchasing is compliant with your contracts. Contracts should be made visible to do the purchasing accordingly, and the focus is therefore on risk hedging and compliance.
3. Supplier optimisation: Creating an overview/database of the supplier base and subsequently, this database should be optimised. The ideal situation would be to optimise input and output by harmonising and cleansing the supplier base and thus deleting vendors if they are not used anymore. This could enhance compliance and provide the opportunity to easily analyse suppliers, identify risks and create reports.
4. Supplier relationship management: The process to gain a competitive advantage and increase the bottom-line performance through supplier segmentation, supplier performance reporting and analytics, and value creation through strategic partnerships.

Since contract management was already described, the following three purchasing functions have been defined: supplier performance review, supplier risk assessment, and segmentation & value creation. Corresponding questions and stages were provided as well.

Groups and coding
Many topics have been touched upon in the interviews. The contents of the interviews can be categorised into four different groups: communication, data, digitalisation, and performance. Appendix H shows Table H.1 containing these groups and codes per maturity domain. There are some topics that were mentioned for every domain, while others were only touched upon once or twice. Especially data analytics, e-tools, standardisation and performance opportunities were mentioned quite often. This will be further elaborated on in the next chapter to extend the model.

4.3 Conclusion Analysis

The literature study identified several core capabilities (E-Sourcing, P2P and SRM) in e-procurement. The company analysis confirmed these findings and enabled the connection between literature and practice by developing six e-procurement domains. Although Schiele (2007) appeared to be most comprehensive, it did not necessarily mean it would be most suitable for an extension on e-procurement. In the end, it appeared it indeed would be the best choice to focus on the Schiele model during the interviews due to its comprehensiveness and slight overlap with the PEx capabilities.

The interviews enabled a review of the existing maturity framework and as a main result, it was identified that the difference between direct and indirect procurement was not taken into account. Furthermore, six e-procurement domains were covered by interviewing various experts. The next chapter will use the interview findings to extend the model and conduct maturity assessments to demonstrate and evaluate the extended model.

Chapter 5: Results & Discussion

The maturity profile instrument of Schiele is extended based on the e-procurement analysis performed in Chapter 4. The final extended model is presented in Appendix I. This chapter will present the changes and additions to the original instrument. Subsequently, the results of the extended model will be demonstrated through the multiple-case study. Finally, the results will be discussed by evaluating the extended model.

5.1 Extension of the Maturity Profile Instrument

The interviews pointed out that besides e-procurement, the difference between direct procurement and indirect procurement should also be touched upon. This is mostly related to general spend management. Therefore, the extension was done in two steps: **(i)** shortly improving the generic model and including Spend Management (OS2), **(ii)** the creation of a sixth dimension called E-Procurement (EP). The generic part should apply to all PSM organisations while the new dimension is up for debate. Table H.1 in Appendix H will be used to explain the extension. One particular code represents multiple keywords, i.e. templates are part of standardisation or platform part of e-tools.

5.1.1 Generic model

The instrument's framework was reviewed with a procurement expert, and small improvements were proposed. Additionally, the interview resulted in the identification of a lack of (in)direct procurement. These will be discussed below.

Improvement of the original five dimensions

The framework review resulted in small adjustments, as described in Section 4.2. However, some feedback had to be disregarded because it would make the generic part of the model tailored too much to *Entity A*. The interview also recognised no domain is included that focuses on the difference between direct and indirect procurement. This would be different from the spend & data management proposed for the extension, which focuses on e-procurement. Therefore, an interview was scheduled with the indirect spend manager of *Entity A*, which is discussed next.

Furthermore, it was decided to create a sixth category called E-Procurement (EP). The interviewee identified certain functions that are the responsibility of the PEx team. However, this does not necessarily have to apply to other companies. The original five dimensions focused on several different procurement processes but did not include assessing digital capabilities. A sixth dimension focusing on e-procurement would be complementary to the original five and show the maturity of a company on its digital processes.

Spend Management (OS2)

The Spend Management domain focuses on the distinction between direct and indirect procurement. The interview resulted in multiple functions covering understanding and awareness, communication and responsibility, the purchasing process, and spend management approach. Although the E-Procurement dimension will be focusing on e-procurement, this domain could provide the foundation for both Spend & Data Management and P2P. Therefore, referring to interview groups and codes in Appendix H, some of the topics that were brought up in other interviews have been put in the stage descriptions as well. The stages slightly touch upon subjects such as a spend management tool and purchasing through e-catalogues to provide a basis. The four domain functions and five corresponding questions are shown below.

- **Understanding and awareness:** How are direct and indirect procurement defined and perceived in the company?
- **Communication and responsibility**: How is the communication and interaction between the different categories and the Region/OpCo? & How is the responsibility divided for the Region/OpCo regarding indirect procurement?

- **Purchasing process**: How are indirect goods and services bought?
- **Approach**: How is the approach for spend management and which tools are used?

5.1.2 Extension on e-procurement

The sixth dimension is an extension to the model to include e-procurement in maturity assessments. The dimension consists of six domains that were identified through a literature study in combination with the company analysis. For each domain, at least one expert was interviewed to determine the key functions, assessment questions and stage descriptions. Internal documents such as company surveys, presentations, and reports, along with direct observations, enabled the expansion of the stage descriptions provided by the interviewees.

Schiele (2007) provided the most comprehensive model and, as a response to Kraljic (1983), adopted a managerial approach to turn purchasing into supply management. However, Chapter 2 observed that all models lack to address the actual change processes of PSM organisational practices. This also applies to Schiele's model because some stages descriptions could be considered too vague or too concise. Therefore, the stage descriptions for e-procurement were designed in such a manner that they should guide firms towards function improvement. If a function reaches a certain stage, the next stage will describe how to proceed. The Table H.1 from Appendix H helped to specify these stage descriptions by using keywords as variables. The following domains have been developed: Spend & Data Management, Contract Management, Market Intelligence, E-Sourcing, Transactional Procurement, and Supplier Relationship Management. These will be discussed separately by describing the functions, questions, keywords and possible bias of the *Corporate Group*.

Spend & Data Management (EP1)

Spend & Data Management builds further on (in)direct spend management. Referring to the third pillar of e-procurement, it enables the proactiveness of SRM due to facilitating supplier reviews through spend reporting and analytics. Thereby, according to the interviewee, there is also some overlap in responsibilities and collaboration with the e-sourcing and Procurement Performance and Reporting (PPR) team. However, it was emphasised that the mindset of the S&D team is that they provide the tools to the business, and they should assess their own performance.

Most of the subjects that have been discussed in the interview have been incorporated in the model extension. This domain could apply to different kinds of PSM organisations, but the data enrichment & refinement function does touch upon categorisation. Therefore, this function may only be partially applicable when an organisation does not use category management. The functions, corresponding questions and keywords are shown below.

Spend & Data Management (EP1)

Appendix: G.5
Data gathering: What is the availability and quality of data that has been provided by the user(s)?
Key words: data availability, data quality, data validation, frequency, automation
Data enrichment & refinement: To what extent is data enrichment and refinement needed?
Key words: categorisation, classification, automation, supplier normalisation
Reporting & analytics: To what extent do users adopt the reporting and analytics tool?
Key words: reporting tool, data source, user needs, opportunity identification, proactive

Contract Management (EP2)

Contract management relates to P2P and SRM, but it was assigned a separate domain due to its importance in the procurement process. This domain contributes to both P2P and SRM by respectively automating the transactional process and enabling the proactiveness of SRM.

According to the interviewee, having a proper contract system in place ensures that the workflow has a minimum of standard approvals and provide an understanding of the contents of the contract and corresponding spend.

Since the domains relate to each other, some keywords were mentioned in one interview while being incorporated in another domain. The Contract Management domain could apply to different PSM organisations because company-specific aspects were not necessarily touched upon in the extension. The functions, corresponding questions and keywords are shown below.

Contract Management (EP2)

Appendix: G.6 & G.9
Standardisation: To what extent is the contract management process managed and standardised?
Key words: approval structure, authorisation, communication, templates, automation
Contract adoption & compliance: To what extent are the contracts adopted and complied with?
Key words: overview, communication, engagement, monitoring, compliance, awareness
Contract analytics: How are the contracts analysed and how is the data used for improvement?
Key words: negotiation cycles, performance analysis, contract improvement, risk

Market Intelligence (EP3)
Market Intelligence is a separate domain and comes into play prior to E-Sourcing as a support function. The team contributes to making strategic sourcing more predictive. This is in line with the interview findings because MI provides the categories with sufficient and insightful information to work on sourcing activities and make (better) strategic decisions based on the MI data. Therefore, strategic buyers should be able to make better and more factual decisions instead of working based on one information source.

Almost all keywords were incorporated in the stage descriptions. Although the MI domain could apply to various PSM organisations, the offerings are particular and may be different for other organisations or not applicable at all. The functions, corresponding questions and keywords are shown below.

Market Intelligence (EP3)

Appendix: G.7
Market analytics: How are the Market Intelligence capabilities within the organisation?
Key words: central team, resources, level of detail, collaboration, availability of offerings, e-tool, digital platform
Communication and adoption: How is the awareness of MI's offerings and to what extent is the data provided by MI optimally used?
Key words: awareness, user needs, integration, efficient use, e-tool, digital platform

E-Sourcing (EP4)
E-Sourcing is a prominent topic in e-procurement and relates to the first pillar of e-procurement, increasing the predictiveness of strategic sourcing. According to the interviewee, a sophisticated platform should be used to interact with suppliers by sharing information and acquiring prices and specifications provided by the suppliers.

The interviewee described the stages in detail, allowing for elaborate guidance on each function. When reaching the more mature stages for the three functions, sourcing should become more predictive due to additional insights and increased efficiency. Although the E-Sourcing domain could apply to various PSM organisations, a firm may need to be fairly large to ensure it reaches stages 3 and 4 because it requires central teams. Thereby, category management is also part of the stage descriptions. The functions, corresponding questions and keywords are shown below.

E-Sourcing (EP4)

Appendix: G.4
Sourcing capabilities: What are the sourcing capabilities?
Key words: e-tools, standardisation, analytics, digitalisation, adoption, savings, efficiency
Organisational structure: Where are the e-sourcing activities located inside the procurement organisation?
Key words: responsibility, training, centralisation, in-house experts, engagement, templates
E-sourcing strategy: Is there a clear strategy regarding E-Sourcing, and how does this relate to the company strategy and underlying category or Region/OpCo strategies?
Key words: frequency, digitalisation, perception, adoption, performance, automation

Transactional Procurement (EP5)
P2P is another popular topic in e-procurement, mainly focusing on automating transactional procurement. As stated in the interviews, the extent to which direct and indirect spend is distinguished relates to the e-P2P capabilities of a company. Therefore, Spend Management (OS2) should be mature before reaching maturity in transactional procurement. In the end, the invoice data should be used to maximise the opportunity for future tenders. Having the basics in order, it would be ideal to have an e-P2P tool that provides a framework that only allows people to purchase services/products if they are authorised to.

Again, most of the keywords were incorporated in the stage descriptions. The stages do not contain company-specific information, so it should apply to different PSM organisations. The functions, corresponding questions and keywords are shown below.

Transactional Procurement (EP5)

Appendix: G.3 & G.8
As-is situation: What is the level of control regarding the P2P processes and to what extent are they automated?
Key words: automation, efficiency, digitalisation
Quality and availability of P2P data: What is the availability of P2P Data and the corresponding quality?
Key words: data availability, data quality, reliability, automation, compliance, e-tool, data validation
P2P metrics and reporting: To what extent do you use metrics and KPIs to manage and challenge the transactional process?
Key words: metrics, reporting, risks, standardisation

Supplier Relationship Management (EP6)
SRM is the last domain in the e-procurement dimension but certainly not the least popular. As the third pillar of e-procurement, SRM should be more proactive. The interviewee had a similar opinion by saying it is all about identifying, analysing and optimising the supplier relationships and gaining a competitive advantage. This includes sustainability initiatives and innovative solutions, while this is quite difficult for major organisations.

It was tried to incorporate this into the domain, and most of the keywords were covered in the stage descriptions. The stages do not contain company-specific information besides mentioning a spend analytics tool, so it should apply to different PSM organisations. The functions, corresponding questions and keywords are shown below.

Supplier Relationship Management (EP6)

Appendix: G.9
Supplier performance review: To what extent is supplier performance measured and how responsive is the organisation?
Key words: performance review, supplier base, harmonised, cleansed, e-tools
Supplier risk assessment: How are supplier risks analysed and managed?
Key words: risk, mitigation, compliance
Segmentation & value creation: To what extent are suppliers segmented and how are the relationships defined?
Key words: segmentation, structural approach, partnerships, collaborations, innovation, sustainability, digital platform

Applicability to PSM Organisations
Chapter 4 provided the process and interview descriptions to define the six e-procurement domains. These domain descriptions were then used to extend the model. This section described each domain by explaining the purchasing functions and corresponding questions. The interview findings were used to relate to the three pillars of e-procurement. Additionally, keywords were grouped and coded to define the stages. This research tried to specify stage descriptions to guide companies through the different stages while simultaneously ensuring the functions would apply to different PSM organisations. Thereby, linked to absorptive capacity, the stage descriptions do not only touch upon the presence of tools but also the use and requirements. It is expected that an OpCo with high maturity also scores higher on the e-procurement dimension than OpCos with lower maturity. The extended model of Schiele (2007) is presented in Appendix I.

Chapter 3 covered the different types of validity and reliability. Internal validity and reliability were sufficiently covered, but questions remain for the additional three types of validity, as shown below.

- **Content validity**: To what extent does the extended maturity profile instrument cover the relevant purchasing functions of e-procurement?
- **Construct validity**: To what extent does the extended maturity profile instrument adequately measure or represent purchasing maturity?
- **External validity**: To what extent can the extended maturity profile instrument be applied to other PSM organisations than *Entity A*?

Content validity. Content validity ensures that the instrument includes an adequate and representative set of items that tap the concept. The literature was connected to practices of the major organisation the *Corporate Group* through expert interviews. However, this is only one PSM organisation in a particular industry. Although this research included e-procurement to the best of its knowledge, it cannot be claimed with full certainty that the extension contains all the domains or functions for e-procurement. Interviews with experts outside the organisation would be required to guarantee content validity fully.

Construct validity. Construct validity is about integrity and soundness, and until now, it was ensured through data triangulation, a clear chain of evidence, and an explanation of the data analysis. The extended model should measure the actual level of purchasing maturity and not the perception of the assessor. However, it is currently uncertain to what extent the instrument adequately measures or represents purchasing maturity. The extension can be evaluated by testing construct validity through a multiple-case study and conduct critical assessments of several business units. The assessment results can be evaluated using the aforementioned propositions.

External validity. External validity, also known as generalisability, was addressed and covered the extent to which the findings of a study can be applied to other settings. It was mentioned

when organisational aspects (cross-functionality, category management, change management) would be involved for each domain. Change management is mostly part of the stage descriptions, so besides occasionally incorporating cross-functional integration and category management, most of the extension should apply to PSM organisations. However, such a claim must be supported. The multiple-case study limits itself to operating companies matching the described company structure and corresponding organisational aspects. Only similar companies should be able to use the entire extended instrument.

Content and external validity have been guaranteed within the scope of the research. Further research would be needed to increase the certainty. Construct validity, on the other hand, can be evaluated through the multiple-case study and its propositions. The demonstration and evaluation of the maturity assessments will be presented and discussed in the next section.

5.2 Model Demonstration

The previous section extended the selected model and now requires a demonstration and evaluation, which is made possible by the multiple-case study. The maturity assessments have been conducted according to the research methodology described in Chapter 3. Although the maturity assessments resulted in quantifiable qualitative data, validation through statistical data analytics would only be feasible in quantitative research. Therefore, the model can only be evaluated qualitatively, which will be done in the next section by discussing the demonstration results. First, this section will present and describe the maturity assessment results and refer back to the three research propositions.

As previously mentioned, the eight selected OpCos represent more than 80% of *Entity A*'s value. For this research, the selected companies are taken as 100% to assign a weight to each OpCo, sub-unit and business unit based on the spend. Appendix K shows several tables that will be the foundation for charts and diagrams to demonstrate and evaluate the overall model and e-procurement extension. This appendix provides the different weights assigned, the assessment results per domain on an OpCo level, the assessment results per dimension on all levels, and the focus on the e-procurement dimension. These tables were created based on the raw but anonymised data from Appendix L.

5.2.1 Overall maturity

The procurement directors of the OpCos were assigned as assessors and participated in the assessments. The directors of A, B, and D were responsible for both OpCos, while for Unit C two different assessors were appointed. The assessors received the extended maturity model upfront, filled in their responses, which were discussed in separate sessions. This ensured they had sufficient time to read and understand the model while not feeling pressured to provide answers on the spot. The overall results of the eight assessments are shown in Figure 5.1. The yellow line in the radar diagram shows the (unweighted) average maturity score *Entity A* per dimension. The red and green lines are respectively the lowest and highest score achieved on a particular dimension by a certain OpCo.

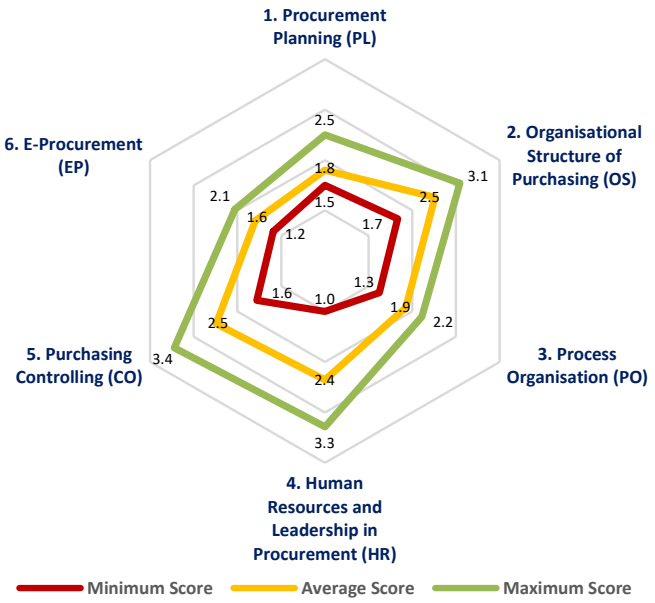

Figure 5.1: Radar diagram of the lowest, average, and maximum score on maturity of Entity A for each dimension

On average, *Entity A* is at the end of stage two for PL, PO and EP while mid-stage three for OS, HR, and CO. The dimensions with a lower average also have a lower distance between the minimum and maximum score, while it is the opposite for higher averages. However, these scores do not provide much insight into the performance of the extended instrument itself. Therefore, the aforementioned propositions have to be referred to. A demonstration of the overall model will show whether the difference in maturity levels is lower for OpCos in the same sub-unit as opposed to OpCos in different sub-units and the certain unit order that was expected. After that, the e-procurement dimension will be zoomed in on to demonstrate the extension.

5.2.2 Demonstration of the overall maturity per OpCo

The second proposition assumed the difference in maturity is lower for OpCos of the same sub-unit as opposed to OpCos in different sub-units. This was mainly expected due to the different levels of centralisation. Figure 5.2 presents the overall maturity level per OpCo on a scale of 0-100%, and will be supported by Table K.3 from Appendix K. An OpCo will always reach at least a maturity level of 25%, unless answers are not provided at all. Therefore, the figure also includes a minimum achievable score of 25% as a reference.

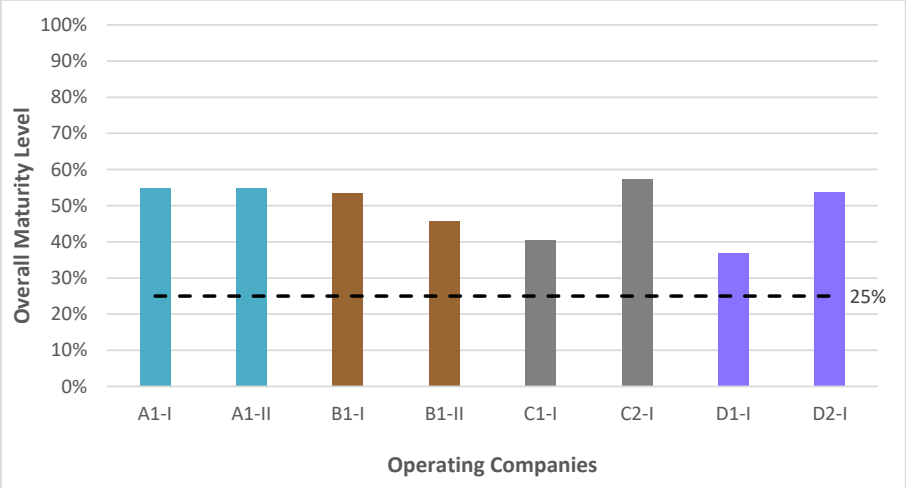

Figure 5.2: Overall maturity level per OpCo, including the minimum achievable score of 25%

Sub-unit A1 is fully centralised, so there were no different scores in any purchasing function between A1-I and A1-II. This is quite logical since the same person centrally manages all the functions. Sub-unit B1 is in a centralisation process, explaining the B1-II's lower maturity in OS and slightly lower maturity in the other dimensions compared to B1-I. The differences between the OpCos in units C & D appear to be bigger. While C1-I scores only slightly lower on PL compared to C2-I, all the other dimensions are significantly lower. The maturity of D1-I is the lowest of the eight OpCos and shows a big gap to D2-I. The second proposition can be accepted since the difference in maturity is higher if OpCos are from a different sub-unit. Two OpCos within the same (sub-)unit can be easily compared, most likely because the assessor is the same for both. However, it seems this would be different if a comparison is done among business units.

5.2.3 Demonstration of the overall maturity per Business Unit

The first proposition stated that it was expected that the overall maturity of the four business units is decreasing in the following order: A, D, then C, and finally B. This was mainly expected due to the difference in available resources and level of centralisation. The second proposition already indicated the effect of centralised sub-units compared to decentralised ones. Figure 5.3 displays the overall maturity per business unit both as an average score as well as a weighted average. The figure is supported by Table K.3 from Appendix K. A variance of 25% points is considered, equal to the stage quadrants. However, since a score below stage one is impossible, the variance is assumed to be 25% of the final maturity level.

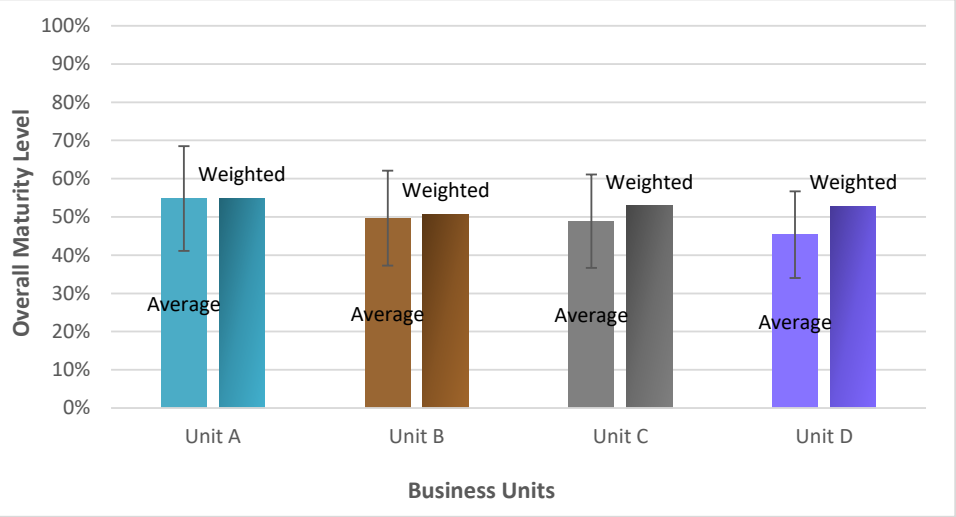

Figure 5.3: Overall maturity level per business unit, including both the average and weighted scores

Figure 5.3 enables a comparison of overall maturity levels among the four business units. The average score is not representative and slightly misleading because it can be largely affected by the smaller and less mature OpCos. However, the variance makes it impossible to actually compare the overall maturity of the units. Although a certain stage was only reached if the assessor's explanation met the requirements, it is still a matter of critical understanding of own performance. Thus, statistically, it is difficult to state anything about the confidence interval. The weighted scores should be more representative but are not as expected. Therefore, the demonstration will zoom in on a dimensional level.

5.2.4 Demonstration of the dimensional maturity

The radar diagram already showed the minimum, average and maximum score on each dimension. Taking a closer look at Figure 5.4, the OpCos, and thus the four business units, perform differently in the various dimensions. Although it is plausible that one unit's strength is another's weakness, the bottom line is that the overall maturity levels appear to be nearly equal. It is remarkable some OpCos score high while their characteristics suggest otherwise. Since maturity level expectations do not match the actual results, Proposition One should be rejected. However, it does not necessarily mean the results are either correct or incorrect.

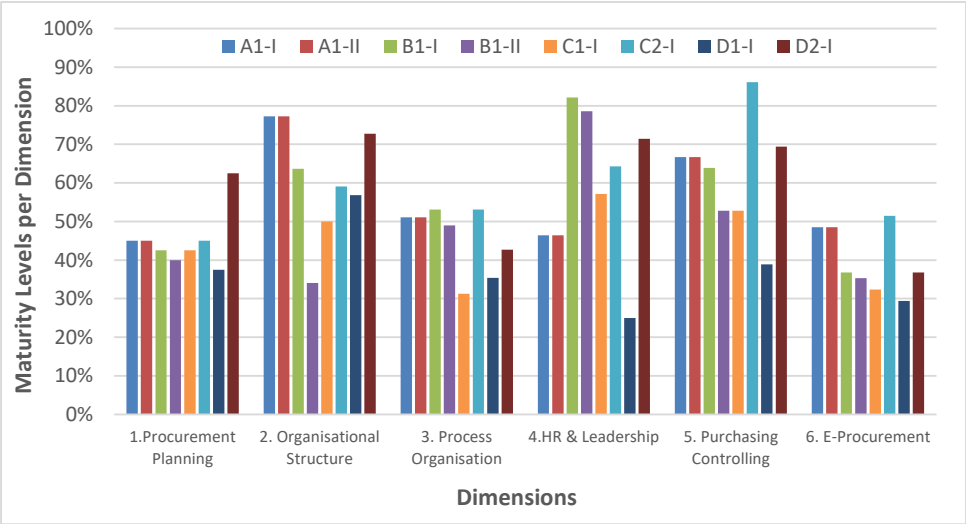

Figure 5.4: Maturity assessment results per dimension for all the OpCos

Although the maturity assessments were conducted with a critical mindset, the provided answers could only be verified to a certain extent. Since Unit A has by far the most resources and its sub-unit is fully centralised, it was expected that the maturity would be significantly higher than the other units. However, the weighted scores were only slightly different, and even then, Unit C scored higher than Unit D. The level of centralisation was already proven to be effective. Still, no conclusion can be drawn regarding the availability of resources.

The model appears to be useful to compare OpCos within the same unit, as long as the same person is interviewed. Table K.2 can then be used to pinpoint certain domains that require improvement. However, a comparison between different units or benchmarking across a larger scale seem to be unfeasible at this point because the maturity levels are simply too close to each other. From a managerial point of view, the scores will still result in an action plan for improvement. From an academic perspective, the question remains whether the model and the assessment approach fail to deliver. If self-criticism of the assessors would be a problem, this should be confirmed by the third proposition. Before explaining and discussing the results, the EP dimension and the third proposition will be reviewed first.

5.2.5 Demonstration of the e-procurement dimension

Proposition Three considered that OpCos with a higher overall maturity should score higher on the e-procurement dimension, but *Entity A*'s overall maturity on e-procurement should not exceed stage two. Compared to other companies of the *Corporate Group*, *Entity A* is currently making less use of the available tools and programs. The extended dimension would be a proper method to demonstrate the self-criticism of the assessors. The overall results of the eight assessments regarding e-procurement are shown in Figure 5.5. The radar diagram is similar to the overall diagram and shows the lowest and highest score achieved on a particular domain by one OpCo, and the (unweighted) average score of *Entity A*.

The average score of each domain is below two, as expected according to the second part of the proposition. The lowest scores are one or slightly above, while the highest achieved scores are also not excessively high. Therefore, the proposition can be partially accepted. However, a further demonstration of the e-procurement extension is needed to verify the first part of the proposition. Figure 5.6 on the next page presents the maturity levels of each EP domain per OpCo and will be supported by Table K.4 from Appendix K.

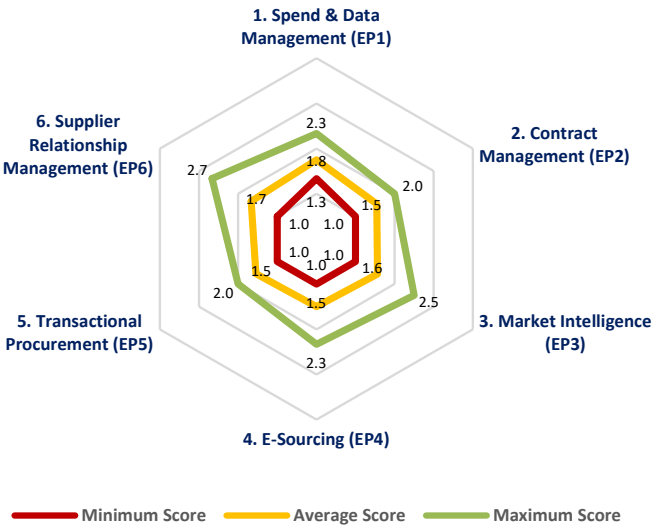

Figure 5.5: Radar diagram of the lowest, average, and maximum score on maturity of Entity A for the EP domains

Proposition One assumed Unit A would be the most mature considering its resources and full centralisation. This should also apply to the domains of E-Procurement. Although this appears correct for some of the EP domains, C2-I and D2-I have slightly higher maturity for several other EP domains. OpCo C2-I is even slightly more mature for the entire dimension. Thereby, it was expected that an OpCo with high maturity, also scores higher on the e-procurement dimension than OpCos with lower maturity. This applies when separately comparing the OpCos from units C and D, but cannot be confirmed with certainty. The extension is not considered insufficient or inaccurate, but its effect has not been fully proven, nor are the results entirely convincing. The maturity assessments provided a lot of insight into the extended model. A final evaluation and proposed solutions will be provided in the next section.

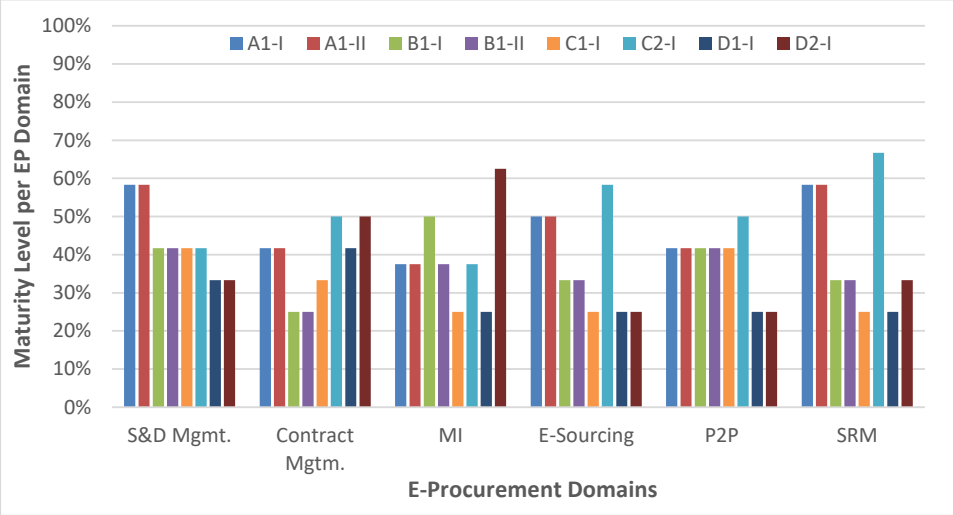

Figure 5.6: Maturity assessment results per E-Procurement Domain for all the OpCos

5.3 Evaluating the Extended Model

The extended model should provide overall, dimension, and domain-specific performance, based on the purchasing maturity levels. The maturity analysis can be done on an OpCo, sub-unit, unit or company level. Then based on where a company wants to be, the model should guide directors and managers towards performance improvements. The evaluation will serve as discussion and refer back to the propositions to provide explanations. Subsequently, the (dis)advantages of the extended model will be described. Finally, solutions will be recommended based on the results and validity of the research study.

5.3.1 Explanation and discussion of the maturity results

Three propositions were formulated to demonstrate and evaluate the workings of the extended model. The common factor was that they were based on a biased opinion of *Entity A*'s procurement director. It was expected that the overall maturity of the four business units would be decreasing in the following order: A, D, then C, and B. The difference in maturity should then have been lower for OpCos of the same sub-unit (A and B) opposed to OpCos in different sub-units (C and D). A higher overall maturity should also have reflected positively on the e-procurement maturity. However, these propositions could not be accepted with full certainty or even had to be rejected. When comparing OpCos across units and sub-units, the overall results were unexpected and it is questionable whether the model actually measures what it intends to measure. The main problem is that the accuracy of these assessment results cannot be determined.

There are several explanations, besides propositions' bias, why the expectations have not been met. First of all, the findings only apply to the multiple-case study. Expanding the multiple-case study would provide more insight into the workings of the extended model. However, since the model is extended through knowledge of the *Corporate Group*, it should be applicable to all its companies. Secondly, the maturity assessments were conducted with a critical mindset, but answers could only be verified to a certain extent. Although it seemed the assessors were honest and critical, the complete removal of bias could not be ensured. Thirdly and lastly, it seems that the e-procurement results are more realistic than the other five dimensions. Comparing results among OpCos, the differences are maybe not as expected but not significantly higher, as is the case for the other five dimensions. The original five dimensions are less elaborate in stage descriptions which likely resulted in incorrect maturity levels. This subsection mainly focused on the research approach and the next subsection will shift its focus to the discussion of the (dis)advantages of the model.

5.3.2 (Dis)Advantages of the extended model

The extended model is the product of several major activities. The main objective of this research was accomplished because the extended model enabled to measure and improve purchasing maturity and performance of PSM organisations in e-procurement. Overall, the extended model can provide a proper performance overview and guide companies towards performance improvements. Especially, the extension on e-procurement provides elaborate stage descriptions, ensuring better guidance while also making it easier for the assessors to identify stages. However, the limitations of Schiele's model have clearly surfaced due to the maturity assessment results. The stages are too rigid and a company already achieves 25% by only reaching stage 1 for every purchasing function. This was already clear from the literature study, but it did not fall within the scope of the research to solve this. The (dis)advantages of the model will be discussed from a managerial point of view an academic perspective because they are profoundly different.

Managerial perspective

The extended model is a powerful tool for PSM organisation when used with the right mindset and right objective. The assessments were processed through the use of advanced sourcing optimisation software to easily analyse results. For this research study approximately 600 lines of input had to be processed, representing only a few OpCos assessed by five people. There are more than 600 people working in procurement and hundreds of companies. Meaning, in case of scaling up the assessment, an enormous number of line item input can be processed without the need of manual labour.

Regarding the model, the overall or dimensional scores do not necessarily have to be accurate from a managerial perspective. The maturity assessments can be quickly and easily executed, providing an incentive for OpCos to design an action plan to initiate improvement. The OpCos are simultaneously guided by the model. Repeating the assessment the subsequent year even provides a method to track progress. For the business, self-assessment could even be better than third-party audits because generally, people do not like to be told what to do.

Academic perspective

The question remains whether the extended model and the assessment approach are successful or fail to deliver. This applies to both the original part of the model and the extension on e-procurement. Comparing the results among OpCos is difficult, because only one person was assigned per OpCo, where each person has most likely a different perception. Schiele (2007) made us of third-party audits and bias was thus less of an problem, while other studies barely touch upon the assessment approach. However, the literature never properly argued against self-assessments, making this limitation less apparent. Obviously, it would reduce the bias, but the issues that surfaced in this researched were never discussed or documented before.

Referring back to the criticism found in the literature, maturity models are criticised for missing features that effectively can explain change interventions. Although this has not been solved for the original part, E-Procurement has been described more elaborately to guide improvement. The insinuations that such models are too rigid for PSM managers to apply are not necessarily confirmed, because the extended model was positively received by *Entity A*. However, there is quite some limitation in benchmarking results because the extended model makes use of only four stages. Then the concept of stage models was also criticised for lack of empirical validation and fixating on the level of individual organisations while providing little practical support. This research study does not argue against this, but the extent to which this is true, certainly depends on the objective and approach of using the the extended model. The next subsection will provide a few recommendations to improve the execution of maturity assessment and re-evaluate the results.

5.3.3 Improving the assessment approach and extended model

Three types of validity were discussed at the end of Section 5.1. The demonstration of the extended model mainly focused on guaranteeing construct validity; "To what extent does the extended maturity profile instrument adequately measure or represent purchasing maturity?". However, recommendations will also be provided to increase the content validity to ensure e-procurement is fully covered in the extension, and increase the external validity to ensure the extended model applies to other PSM organisations other than *Entity A*. The recommendations consist of two directions, improving the assessment approach, and improving the model.

Recommendations for the assessment approach

The quality of assessment results would be increased if maturity levels were assessed through third-party audits. Although it appeared the assessors were able to critically assess the performance of their OpCos, the results are not conclusive. Therefore, three changes are recommended to improve the maturity assessments regarding construct validity:

- **Include a control person during the assessments**.
  This person should be experienced in a certain dimension and would be able to critically assess whether a purchasing function is indeed the stage as is indicated by the assessor. Additionally, to ensure OpCos actually improve, the control person could summarise why certain stages were not reached and what should be done to proceed.
- **Include experienced people that will conduct the assessments**.
  The assessments were conducted by the researcher itself, someone with only minimal experience in procurement and the organisation, contrary to the assessors that have years of experience. Therefore, including or replacing the one that conducts the assessments with a more experienced person would likely result in more realistic maturity levels.
- **Conduct multiple maturity assessments with different company roles**.
  This research study made use of one assessor per OpCo, each of them fulfilling a strategic role in the company. Although these people were experienced, in the end it is only one assessment that is partially fact-based and partially opinion-based. A solution could be to conduct multiple separate assessments for the same OpCo to get a better view of the maturity. Assessors should then consist of people that fulfil strategic and operational roles. Weights can then be assigned to each assessor based on their experience and company role. Since maturity is likely flowing down in a top-down structure, meaning operational maturity could be lower than strategic maturity.

The maturity assessments were conducted once for the case studies to demonstrate and evaluate the extended model. However, to bring more value for *Entity A* and perhaps the *Corporate Group*, a protocol (Standard of Operations (SOP)) should be drafted to increase the value of maturity assessments. It is important to know how the tool should used and implemented, and whether there is a focus on certain dimensions or a specific set of goals. This protocol can also be more general and apply to other PSM organisations. The following topics should then be considered for this protocol to ensure consistency:

- How should the results be used (e.g. benchmarking, roadmap)? —>
  Summarise why stages are not reached and how to proceed to initiate improvement.
- Who will conduct the maturity assessments? —>
  Put together a team of experienced people to conduct the maturity assessments.
- On what level should maturity be assessed? —>
  Determine the level of analysis and comparison (e.g. division, unit, sub-unit, OpCo).
- Who should be assigned an assessor to provide the stages? —>
  Think of evidence that should be provided to reach a certain stage.

- At what frequency are the assessments conducted? —>
  Conduct the assessment at a standard frequency (e.g. twice a year, yearly).

Recommendations for the extended model
Furthermore, the extended model leaves room for improvement to guarantee content and external validity.

- **Increase generalisability of the model**
  The multiple-case study limits itself to operating companies matching the described company structure and corresponding organisational aspects. Only similar companies should be able to use the entire extended instrument. Therefore, the model must be applied to more companies and different settings to ensure generalisability. Furthermore, it would be interesting to determine whether self-assessments result in significantly different maturity levels compared to third-party audits. The use of external audits have been preferred by the literature, but this research study proved self-assessments have benefits as well. Thereby, this would provide more insight into the workings of the model. Lastly, it could also help to expanded the maturity instrument by applying a weighted system to calculate the overall maturity based on a company's priorities. Since companies may prioritise differently regarding the various dimensions and domains, this could be a required addition to tailor models to various organisations.
- **Validate the inclusion of e-procurement**
  The *Corporate Group* also has the PPR department that focuses on performance and reporting. Although this has been included in the stage descriptions, perhaps it should be a separate domain in e-procurement. Thereby, learnings from other PSM organisations should be taken if e-procurement is not fully covered yet by the *Corporate Group*. Interviews with more experts are required to further validate the model. If interviews are conducted outside the organisation, this would fully guarantee content validity.
- **Statistical analysis**
  This research took a qualitative approach and thus, any statistical analysis would be unreliable. However, if a future research study would shift the focus to the validation of the extended model, this could provide the opportunity to prove the different types of validity statistically. Perhaps different types of stages can be used as well, for example, the use of a grade or % instead of the stages as strict limits.

Recommendations have been provided to support the different types of validity for future research. The next chapter will provide the final conclusion and recommendations of this research study.

Chapter 6: Conclusion & Recommendations

This research study aimed to select and extend an existing maturity model to measure and improve purchasing maturity of PSM organisations by including e-procurement in a qualitative manner. This chapter will provide an overall conclusion, followed by the scientific and managerial implications. Furthermore, the limitations of the research will be described, and potential future research will be recommended. Finally, a reflection on the Management of Technology curriculum will be provided.

6.1 Overall Conclusion

The main research question was "*How to measure and improve the purchasing maturity and performance of PSM organisations in digital procurement?*". Existing maturity models lacked a proper fit for purchasing firms using e-procurement. This research extended the comprehensive maturity instrument of Schiele (2007) by including a spend management domain and an entirely new dimension focused on e-procurement to include assessment of digital processes and drive its transformation. The e-procurement dimension consisted of six domains and covered the earlier identified core capabilities (E-Sourcing, Procure-to-Pay, and Supplier Relationship Management). The extended model enabled measuring the purchasing maturity of operating companies on various purchasing functions and improving based on the assessment results. The literature barely focused on self-assessments, and this research study provided a good alternative to external audits. This research study also digitalised the assessment approach, showing that digital transformation is important for improving processes.

However, the extended model is not infallible, nor is digitalisation always the first or best option. The extended model is primarily tailored to the *Corporate Group*, and the assessment results were not conclusive. The self-assessments resulted in maturity levels different from the expectations, which may have been different in assessing through third-party audits. The four stages of Schiele's model were rigid, as was criticised by the literature. The stage descriptions of e-procurement were elaborately described to solve this issue within the new dimension, but the four stages are still too rigid. It does not necessarily mean the model is not easy to use, but it mostly prevents proper benchmarking. The scientific and managerial implications will be highlighted in the following sections. Finally, the limitations of the research study will be described, which could be solved in potential future research.

6.2 Scientific Implications

This research study provided a foundation for assessing purchasing maturity of PSM organisations in e-procurement using an extended maturity model. The extension is achieved by connecting the literature with experiences and knowledge from a major procurement firm. This enabled to provide an elaborate extension on e-procurement, which would not have been possible without the company knowledge. Even though the scientific gap has not been closed yet, the efforts of this research study are a valuable addition to academic knowledge. However, some main issues need to be addressed.

Maturity models are criticised for being too rigid and lacking proper guidance towards improvement. Although Schiele's model is quite comprehensive, the criticism still applies to the model, and to a certain extent, to the extension as well. The e-procurement extension is elaborate and based on the literature but was mainly developed through expert interviews from only one PSM organisation. Therefore, it cannot be claimed with full certainty that e-procurement is covered to the full extent. The applicability of the extended model to other organisations is still questionable but could be compatible if a company is characterised by cross-functionality and category management. However, there is no scientific foundation for such a claim, and at this point, the model is mostly tailored to the *Corporate Group*. Several questions have been raised that will be addressed in the research limitations and potential future research.

6.3 Managerial Implications

From a managerial point of view, this research study managed to extend a comprehensive maturity model by developing a new dimension on e-procurement. The sixth dimension is supported by literature but is also matching the organisational structure of the Procurement Excellence team. The purchasing functions and corresponding stage descriptions allow for a detailed review of the company performance, and the subsequent stage descriptions simultaneously show how to proceed.

The multiple-case study covered a large part of *Entity A*'s companies and can easily be expanded. The maturity assessments have been efficiently processed through the use of internal sourcing optimisation software. It even presents the opportunity to do a company-wide review where all employees can fill in the template and upload it for analysis. Therefore, this research study provided a proper foundation for *Entity A* and the *Corporate Group* to measure their company performance on a large scale. The limitations of the research will be addressed to allow for potential solutions in future research.

6.4 Research Limitations

The criticism from the literature already confirmed the main limitation of this research study. Still, it only surfaced because OpCos were asked to score their own maturity instead of using third-party audits. Although the assessors were able to critically assess their OpCos' performance and explain the appointed stage levels, the results were not conclusive. Thereby, the e-procurement dimension is comprehensive but not confirmed to be entirely complete.

Applying the model in a multiple-case study provided unexpected results, and the formulated propositions could only be partially accepted. The extended model provided a method to properly assess the maturity of individual OpCos, but it appeared less reliable when comparing OpCos outside of their unit. The multiple-case study has not proven that the extended model measures what it intends to measure, namely, purchasing maturity. However, the literature has always focused on third-party audits, and therefore, this problem was less apparent. Maturity assessments conducted in this research are affected by bias, which applies to both the original and extended parts of the model. The effect seemed less significant for the extension, which could be explained by the more elaborate stage descriptions. The possible explanations cannot be fully confirmed, but they do allow for potential future research to either improve the assessment approach or quantitatively validate the extended model.

6.5 Potential Future Research

The research limitations allow for further research to solve the main issues. The assessment approach could be improved by including a control person and more experienced people to conduct the assessments. This should ensure critical thinking and result in more realistic maturity levels. The assessments are proposed to be conducted with multiple assessors per OpCo, of different roles and backgrounds to acquire a consolidated overview. A protocol should be drafted to increase the value of the assessments by describing the approach, specific goals, analysis and next steps. However, this would be more useful after the validation of the extended model.

The extended model provides a proper basis to assess PSM organisations in e-procurement but has not been validated yet. Interviews or surveys with procurement experts from different companies or industries could show to what extent e-procurement is covered in the new dimension and whether the extended model can be generalised and thus used by other companies than the *Corporate Group*. Subsequently, it seems interesting and possibly strengthens the findings of this research to conduct quantitative research on a wide variety of cases to prove or disregard propositions statistically.

6.6 Reflection on Management of Technology

The Master's study Management of Technology (MOT) teaches students to conduct critical scientific research in a technological context. This Master's thesis adhered to that philosophy by providing both a managerial perspective as well as an academic point of view and acknowledging its value and limitations. Thereby, this research study's main topics were digital procurement, a relevant and technological subject for PSM organisations.

This thesis could not have been written without the knowledge and skills obtained by the researcher through the MOT curriculum. A foundation was provided by the MOT course Research Methods (MOT2312), primarily to conduct research correctly and ensure the research reliability and validity. Furthermore, the Supply Chain Specialisation ensured a proper understanding of large organisations and complex processes such as procurement. Scientific methods and techniques were used to analyse the research problem, as is expected from a Master student. Various activities had to be executed to achieve the research objective, such as a literature study, a company analysis, expert interviews, and a multiple-case study. The latter revolved around the maturity assessment of several OpCos and subsequently analysing the corresponding qualitative data. The research study provided new academic insights and also resulted in the development of a powerful tool for procurement managers to initiate improvement.

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Appendices

Appendix A: Sourcing Lever Analysis

Complementary to the maturity assessments, Schiele (2007) measured cost savings in commodity workshops to determine a firm's performance of purchasing. Former research studies regarding maturity models had the problem of common method bias or lacked to measure and express performance in financial terms. Schiele (2007) tried to solve this by focusing on the fact that purchasing has a direct influence on savings of materials and services through the reduction of cost purchased goods over time.

The workshops are supported by a method called sourcing lever analysis, where sourcing levers describe tactics to achieve sourcing targets for diverse categories of materials or services (Hesping & Schiele, 2016). Therefore, cost savings are a measure of the performance expected from purchasing, providing a valid performance indicator. The sourcing lever analysis has a two-fold purpose. On the one hand, the analysis is complementary to the maturity assessment. On the other hand, it can also provide additional insights to extend the maturity instrument. Thereby, recent research studies are still trying to extend the analysis and provide frameworks to improve and conceptualise measurements (Bals et al., 2018; Hesping & Schiele, 2015, 2016).

Lever analysis workshops enable cross-functional teams to discuss savings opportunities arising from each lever (Schiele, 2007). The cost savings are measured in real monetary terms and reflect ideas from the entire group and not just a single individual. The sourcing lever analysis provides the opportunity to match the maturity of purchasing organisations with the performance in commodity performance workshops. In other words, a cross-functionally verified savings potential can be used as a measure to reflect expected future performance. Although the lever analysis is complementary to the maturity assessment, these workshops can be conducted independently of maturity analysis.

Traditionally, the lever analysis considers six sourcing levers. However, Schiele (2007) expanded the analysis with an additional lever to the total number of seven. Although these seven sourcing levers are not necessarily incorrect, Hesping and Schiele (2016) provides a conceptual framework with a slightly adapted and contemporary version of the sourcing levers. This framework is shown in Figure A.1 and can be used as a basis for conducting lever analysis workshops.

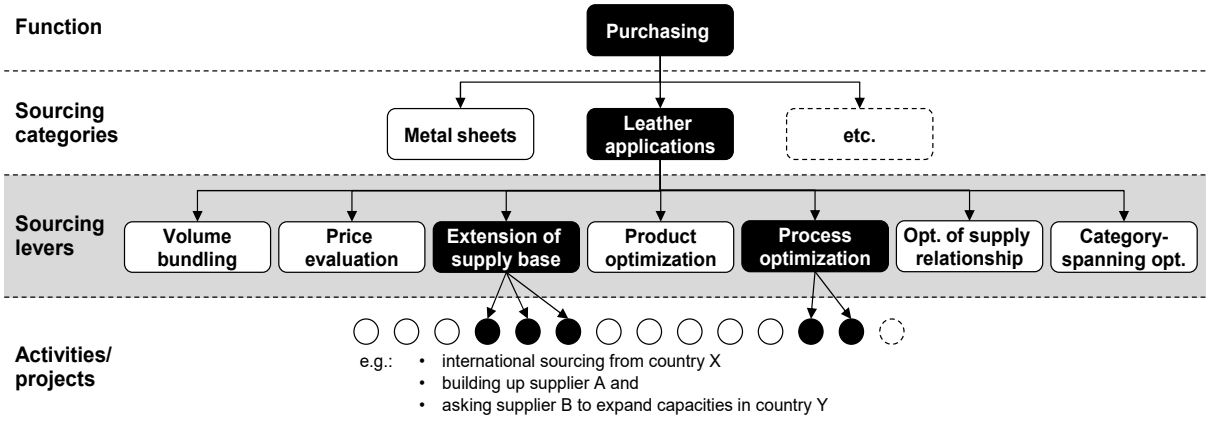

Figure A.1: Conceptual framework of sourcing levers by Hesping and Schiele (2016)

Appendix B: Maturity Models

B.1 Model descriptions

Cousins et al. (2006)
Cousins et al. (2006) conducted a cross-sectional survey using a hypothesis test to build further upon the research of Reck and Long (1988).

Focus: An empirical test of purchasing function configurations to measure and improve organisational performance.
Principle: A cluster analysis uncovered and characterised four purchasing function configurations, termed strategic, capable, celebrity, and undeveloped. These four purchasing function configurations showed significant differences in supplier- and organisational-related performance outcomes. The model determines each purchasing function's current standing by identifying the characteristics and potential limitations of each phase. Thus, enabling enhancement of the maturity performance.
Model: 8 purchasing functions consisting of 24 items, each divided into 4 stages.
Limitations: The model only consists of 8 different purchasing functions to assess the purchasing maturity, but the stage descriptions are not provided.

Paulraj et al. (2006)
Paulraj et al. (2006) provided statistical analysis from a survey on strategic PSM constructs to extend the research of Van Weele (1984), Reck and Long (1988), and Freeman and Cavinato (1990).

Focus: An empirical analysis on the effect of the strategic level of purchasing on a firm's performance and its suppliers.
Principle: The study examined the effect of strategic purchasing on buyer performance on both financial as well as operational measures. Strategic purchasing is characterised by the strategic focus, strategic involvement of the purchasing function and the status, and visibility of the purchasing professionals. Thereby, supply integration was identified as a second-order construct, composing relational, process, information, and cross-organisational team integration.
Model: 8 purchasing functions, distributed over 52 questions. Each function consists of 3 stages (Level 1, Level 2, and Level 3).
Limitations: The model primarily focuses on strategic purchasing and thus, abstaining from considering additional factors that influence purchasing performance. Thereby, the absence of stage level descriptions makes it difficult to apply the model.

Schiele (2007)
Schiele (2007) developed a comprehensive maturity instrument to measure and improve purchasing maturity as a function of financial performance. In contrary to former literature, several models (ten) were compared and taken into account.

Focus: A comprehensive framework to assess the entire maturity profile of PSM organisations as a function of financial performance.
Principle: The financial performance of mature PSM organisations was examined through extensive purchasing audits and the use of a comprehensive instrument. The model is deducted from theory in terms of conceptualising the maturity profile by five dimensions: procurement planning, the structural organisation of the purchasing function, process organisation, human resources embedded in the firm, and purchasing controlling structures. Thereby, a new concept is introduced to explain the difference in purchasing maturity across various organisations.
Model: 56 purchasing functions, distributed over 19 domains, consolidated in 5 dimensions. Each function consists of 4 stages (0-25%, 26-50%, 51-75%, and 76-100%)
Limitations: The stage descriptions of the model do not always address how to improve the function for an organisation to get to the next stage.

Bemelmans et al. (2013)
Bemelmans et al. (2013) developed and tested a quick scan purchasing maturity instrument for prime contractors in the construction industry to determine the current level of purchasing maturity and provide possibilities for improving performance.

Focus: A quick scan purchasing maturity instrument for the construction industry
Principle: A maturity instrument is developed and tested through applying the design science research method of Hevner et al. (2004), taking learnings from Van Weele (2009). The instrument quickly assesses the purchasing maturity of a single business unit and suggests possibilities to improve performance within approximately 2-3 hours. It is specifically developed for a business company in the construction industry to monitor and improve the purchasing maturity.
Model: 20 purchasing functions rated as a percentage and linked to one or more of the 6 different stages (Transactional orientation, Commercial orientation, Purchasing coordination, Internal integration, External integration, and Value chain integration).
Limitations: It is unclear how the instrument should be applied to an organisation. It seems to be a computer model based on the input of company data, but the research lacks insight into the workings of the instrument.

B.2 Cousins et al. (2006)

Strategic planning
To what extent do you agree with the following statements about purchasing's level of involvement in strategic planning within your firm?

SP1 Purchasing is included in the firm's long strategic planning process

SP2 Purchasing performance is measured in terms of its contributions to firm's success

SP3 Purchasing professionals' development focuses on the elements of the competitive strategy

SP4 Purchasing's focus is on longer term issues that involve risk and uncertainty

SP5 The purchasing function has a formally written long range plan

Purchasing status
To what extent do you agree with the following statements about the status of the purchasing function within your organisation?

STA1 Top management is supportive of our efforts to improve the purchasing department

STA2 In this company, purchasing is considered a vital part of our company strategy

STA3 Purchasing's views are considered important in most top managers' eyes

Internal integration
To what extent do the following statements reflect the level of integration of the purchasing function within your firm?

INT1 Purchasing regularly attends strategy meetings

INT2 Purchasing recommends and initiates changes in end products and inputs, based on supply market analysis

INT3 A high proportion of purchasing personnel spend time in market and price/cost analysis

INT4 Purchasing participates in new product design

INT5 Purchasing participates in process design and improvement

INT6 Purchasing is measured on strategic contributions to the company (e.g. new products/technologies), versus cost and efficiency contributions

Purchasing skills
How much do you agree with the following statements about the level of purchasing personnel's knowledge and skills within your firm?

SKL1 Purchasing professionals have the necessary skills to monitor and interpret changes in the supplier market/product base

SKL2 Purchasing professionals have the technical capabilities to help our suppliers improve their processes and products

SKL3 Purchasing professionals have the necessary skills to improve the firm's total cost of doing business with the firm's suppliers

SKL4 Purchasing professionals demonstrate perseverance, imagination, decisiveness and interpersonal skills

Supplier integration
Please indicate the degree of external integration between your organisation and its strategic suppliers:

SIN1 Information exchange with suppliers through information technology

SIN2 The level of strategic partnership with suppliers

SIN3 The participation level of suppliers in the design stage

SIN4 The participation level of suppliers in the process of procurement and production

SIN5 The establishment of a quick ordering system

SIN6 Stable procurement through network

Supplier relationship outcomes
To what extent do you agree with the following statements about the performance of your supplier partnerships?

SRO1 In the last 2-3 years, we have continued to be able to improve product design performance through these partnerships

SRO2 In the last 2-3 years, we have continued to be able to improve process design through these partnerships

SRO3 In the last 2-3 years, we have continued to be able to improve product quality through these partnerships

SRO4 In the last 2-3 years, we have continued to reduce lead through these partnerships

SRO5 In the last 2-3 years, our partnerships have contributed to increasing product sales

Production performance
Please rate your current level of your firm's performance on each of the following dimensions compared to that of your major competitors:

PROD1 Product quality

PROD2 Delivery speed

PROD3 Delivery reliability

PROD4 Flexibility of production

Financial performance
Please rate your current level of your firm's performance on each of the following dimensions comp ared to that of your major competitors:

FIN1 Return on investment

FIN2 Return on sales

FIN3 Profit growth

FIN4 Return on total assets

B.3 Paulraj et al. (2006)

Strategic purchasing

SP1 Purchasing is included in the firm's strategic planning process

SP2 The purchasing function has a good knowledge of the firm's strategic goals

SP3 The purchasing function has a formally written long-range plan

SP4 Purchasing performance is measured in terms of its contributions to the firm's success

SP5 Purchasing professionals' development focuses on elements of the competitive strategy

SP6 Purchasing's focus is on longer-term issues that involve risk and uncertainty

SP7 Top management considers purchasing to be a vital part of our corporate strategy

SP8 Purchasing's views are important to most top managers

SP9 The chief purchasing officer has high visibility within top management

SP10 Top management emphasizes the purchasing function's strategic role

SP11 Purchasing department plays an integrative role in the purchasing function

Limited number of suppliers

LS1 We rely on a small number of high-quality suppliers

LS2 We maintain close relationship with a limited pool of suppliers

LS3 We get multiple price quotes from suppliers before ordering

LS4 We drop suppliers for price reasons

LS5 We use hedging contracts in selecting our suppliers

Long-term relationships

LR1 We expect our relationship with key suppliers to last a long time

LR2 We work with key suppliers to improve their quality in the long run

LR3 The suppliers see our relationship as a long-term alliance

LR4 We view our suppliers as an extension of our company

LR5 We give a fair profit share to key suppliers

LR6 The relationship we have with key suppliers is essentially evergreen

Logistics integration

LI1 Interorganizational logistic activities are closely coordinated

LI2 Our logistics activities are well integrated with the logistics activities of our suppliers

LI3 We have a seamless integration of logistics activities with our key suppliers

LI4 Our logistics integration is characterized by excellent distribution, transportation and/or warehousing facilities

LI5 The inbound and outbound distribution of goods with our suppliers is well integrated

LI6 Information and materials flow smoothly between our supplier firms and us

Two-way communication

CO1 We share sensitive information (financial, production, design, research, and/or competition)

CO2 Suppliers are provided with any information that might help them

CO3 Exchange of information takes place frequently, informally and/or in a timely manner

CO4 We keep each other informed about events or changes that may affect the other party

CO5 We have frequent face-to-face planning/communication

CO6 We exchange performance feedback

Inter-organizational information systems

IT1 There are direct computer-to-computer links with key suppliers

IT2 Interorganizational coordination is achieved using electronic links

IT3 We use information technology enabled transaction processing

IT4 We have electronic mailing capabilities with our key suppliers

IT5 We use electronic transfer of purchase orders, invoices and/or funds

IT6 We use advanced information systems to track and/or expedite shipments

Supplier involvement—general purposes

GP1 We collocate employees to facilitate cross-functional integration

GP2 We coordinate joint planning committees with our suppliers

GP3 We promote task force teams with our suppliers

GP4 We share ideas and information with our supplier through cross-functional teams

GP5 We use supplier involved ad hoc teams based on our strategic objectives

GP6 We encourage teamwork between our suppliers and us

Supplier involvement—product development

PD1 We involve key suppliers in the product design and development stage

PD 2 We have key supplier membership/participation in our project teams

PD 3 Our key suppliers have major influence on the design of new products

PD 4 There is a strong consensus in our firm that supplier involvement is needed in product design/ development

PD 5 We involve our key suppliers in business and strategy planning

PD 6 We have joint planning committees/task forces on key issues with key suppliers

B.4 Schiele (2007)

Table B.1: Maturity profile instrument by Schiele (2007)

Function	Questions for Analysis	Current level	Stage 1 (0% - 25%)	Stage 2 (26% - 50%)	Stage 3 (51% - 75%)	Stage 4 (76% - 100%)
1. Procurement Planning (PL)						
Demand Planning (PL1)						
Process	**To what degree is purchasing involved in the project/product planning? Is this a documented and revolving process?**		Product or project planning is sporadically known to purchasing.	Dedicated purchasing personnel are informed about product or project planning. Purchasing has access to demand planning systems.	Purchasing is integrated into product and project planning and utilises existing demand planning systems. Purchasing inclusion points are defined in the process documentation.	Early involvement of purchasing in product and project planning is always ensured. Planning results are an integrative component of the purchasing strategy.
Assessment of Demand	**Where are requirements and demands derived from? How is the process described?**		Demands are partly derived from sales or order income prognosis/forecasts.	Demands are derived from sales or order income prognosis/forecasts and planned for significant commodity areas.	Demands are derived systematically and in structured fashion from sales or order income prognosis/forecasts. Procurement market facts are remedially considered.	Pro-active demand control on the basis of procurement market facts and product life-cycles (Product Lifecycle Management).
Pooling Planning (PL2)						
Planning	**Are commodities analysed for group-wide pooling potential?**		Occasional analysis of selected commodities.	All commodities are analysed based on commodity code data.	Complete purchasing volume is permanently analysed in regard to pooling opportunities. Results are documented.	Future demands are analysed regularly of their pooling opportunities Cross-functional partners are involved.
Mandates	**How are negotiation mandates and responsibilities defined?**		Regulation of negotiation mandates and responsibilities is planned.	Negotiation mandates and responsibilities are partially regulated for single commodities.	Negotiation mandates and responsibilities are regulated. Process applied for all commodities.	Negotiation mandates are delegated and responsibilities are clearly defined on a global basis. Mandates are actively applied.
IT Support	**Which IT tools support you when analyzing and managing poolable demand?**		Insufficient application of IT tools for pooling (e.g. Excel or similar IT-tools).	Application for a business unit wide IT tool for pooling.	Application of a uniform IT-tool for group-wide pooling.	Application of an integrative intranet-based IT tool for corporate-pooling? Intranet based preferred parts and preferred suppliers database used cross-functionally.
Environment Scanning (PL3)						
Process	**How is the process of a supply market analysis described and documented?**		Process is described unsatisfying.	Process is partially described.	Process is documented and applied.	Processes subject to regular reviews. Cross-functional acceptance and commitment.
Resources	**Is sufficient personnel allocated to market analysis?**		Provision of personnel capacity of supply market analysis is limited available.	Sufficient personnel for market analysis is available. Responsibilities and commodity groups are defined.	Own capacities for market analysis are derived out of the planning process and are available for market scan activities.	Capacities for market analysis (own and where necessary bought) are available. Cross-functional partners can be involved if required.
Cross-functional integration	**How are partner functions involved in drawing conclusions out of the analysis results?**		Results out of the supply market analysis remains mostly at purchasing.	Less active exchange with other process partners (e.g. Engineering, Sales).	Regular information exchange with partners (e.g. Engineering, Sales).	Exchange of market analysis results occur continuously and protected against non-authorised use.
Innovation Planning (PL4)						
Technology identification	**How do you keep track of technology trends? Is there a formal process of technology monitoring?**		Purchasing reactively follows procedures of process partners (e.g. Engineering, Sales).	Purchasing present remedially information about technology trends to their process partners. Technology monitoring is part of purchaser's responsibilities.	Purchasing acts pro-actively following established processes.	Purchasing support systematically product or technology development. Information about technology trends will be used through cross-functional partners.
Technology roadmaps	**Do purchasers know the technology roadmap of your company and your suppliers? Is there a methodology of correlating your technology roadmaps with those of your suppliers?**		Own product and technology roadmaps partially known.	Own product and technology roadmaps are known, those of strategic suppliers are partially known. Responsibilities for roadmap-analysis defined.	Process of matching own product and technology roadmaps with the roadmaps of significant suppliers.	Implementation of harmonised product and technology roadmaps with selected suppliers, cross-functionally agreed.
Organisational Structure of Purchasing (OS)						
Structure & Mandates (OS1)						
Organisational structure	**Is a purchasing organisation established? Are responsibilities defined?**		Purchasing responsible people are named. Purchasing organisation is insufficiently established.	Purchasing organisation is formally in place.	Purchasing organisation is established and is in charge of all procurement activities. Procurement policy is described and communicated via internal circular latter as mandatory.	Purchasing organisation is continuously further developed based on business strategy, benchmarks, interviews or process reviews.
Mandates	**Is purchasing responsible for all procured goods and services? Do you have regulations for sanction in case of non-compliance?**		Many commodities are not managed in responsibility of purchasing.	Purchasing initiates programs and measures for mandating procurement fields. Penetration >50%.	Purchasing has the mandates for complete purchasing volume defined mandatorily and communicated. Penetration >80%.	Regulations for sanctions in case of non-compliance are introduced. Penetration ca. 100%.

Cross-functional integration	**Are interfaces towards partner functions defined? Are they cross-functionally agreed and responsibilities defined?**		Interfaces of purchasing are known and tasks are partially described.	Interfaces are cross-functionally agreed for isolated function. Respective tasks and responsibilities at the partner functions are known.	Tasks and responsibilities are coordinated with all interfaces according to company wide defined processes and are described in a guideline.	Purchasing drives continuous improvement and the definition of interfaces and guideline.
integration into group	**How is purchasing integrated in the purchasing network of the group?**		Purchasing acts locally without exchange with other purchasing departments.	Purchasing remedially exchanges information with other purchasing departments.	Purchasing is an active part of the group-wide procurement network.	Purchasing is an integrative part of the worldwide procurement network of the group.
Strategic integration (OS2)						
Board meetings	**Does the purchasing director take part in board meetings?**		Purchasing director participates occasionally in the board meetings.	Purchasing director is permanent member of the board committee.	Purchasing director is permanent member of the executive committee of the business unit.	Purchasing director directly reports to business unit Executive Management (CEO/CFO).
Make-or-Buy decisions	**Is purchasing involved in all make-or-buy decisions? Does purchasing take part at core competency definition and strategic decisions?**		Purchasing is informed about procurement related aspects in make-or-buy projects. Core competencies of the business units are defined, but without purchasing involvement.	Procurement is involved in major make-or-buy decisions. Core competencies of the business unit are detailed documented and published.	Purchasing is involved in all make-or-buy decision and influences the definition of core competencies, as part of strategy definition.	Purchasing is an integrative part of the make-or-buy decisions. Purchasing tasks are documented and cross-functionally accepted. Potentials for optimisation of the depth of own value added are indicated along the product life-cycle.
3. Process Organisation (PO)						
Strategic Sourcing (PO1)						
Sourcing Strategy	**How would you describe your sourcing strategy? Is it documented and known to your partner functions?**		Defining of a sourcing strategy is in progress.	Sourcing strategy is documented and applied for all major material groups.	Sourcing strategy is derived out of corporate strategy, cross-functionally agreed, documented and applied.	Sourcing strategy is defined as a roadmap, regularly updated, adjusted to corporate strategy and tied into target agreements.
Process supplier selection	**Is supplier selection carried out systematically and according to requirements profile and selection criteria? Is the selection process well defined, logical and documented?**		Supplier selection process is not or only partially described.	Selection process is defined and cross-functionally applied. Supplier selection occurs systematically based on requirement profiles and selection criteria.	Selection process is completely applied. Supplier decisions are traceable documented (e.g. quotation comparison sheet).	Supplier selection is based on complete application of insights and decisions throughout the company (e.g. pooling organisation, supplier evaluation results, etc.). Selection process is continuously adjusted to latest requirements of the business unit.
Responsibility	**Who is responsible for supplier selection?**		Purchasing is not or only partially involved in supplier selection.	Purchasing supports supplier decisions.	Purchasing is process owner for the supplier selection process.	Cross-functional decision-making committee (e.g. Sourcing Committee) is in charge of the supplier selection process.
Supplier selection (PO2)						
Process documentation	**Is the sourcing process documented?**		Sourcing process is documented insufficiently.	Approach for sourcing has been defined internally in purchasing.	Compliance with the documented and cross-functionally accepted sourcing process.	The organisation is aligned to support the sourcing process.
Negotiation	**If preparing a negotiation, do you follow a uniform and systematic approach? Are decision criteria, tactics, and targets agreed cross-functionally?**		Less negotiator preparation.	Systematically preparation approach. Negotiation targets are explicitly defined and documented. Customer requirements are considered the negotiation strategy.	Cost structures of suppliers are analysed. Procurement relevant consequences from possible negotiation results are analysed and evaluated. Negotiation targets are methodically deducted and explicitly defined. Process is described.	Future influencing factors on cost structure of suppliers are considered (cost reduction potentials, market prices, funding, etc.). In the case of awarding high-volume contracts, structured negotiation strategies are applied. Decision-making criteria are accepted cross-functionally.
Contract Management	**Do you have a Contract Management function in your organisation and what are its activities?**		Tasks are hardly described and are covered within other responsibilities. No application of standardised contracts.	Tasks are isolated described contact partners are known. Application of company wide and existing standards.	Task is pursued by responsible persons and shows first results. Application of standards under group wide adoption and owns structure (e.g. contract configurator).	Function is an established interface between cross-functional partners and purchasing. Functions significantly drives and determines contract management issues. Group wide standards are communicated and are valid.
Supplier evaluation (PO3)						
Process	**Is there a systematic procedure for Supplier Evaluation in place?**		There is no supplier evaluation systematics in place.	Less than 60% of the purchase volume is evaluated according to an applied supplier evaluation systematics.	60 - 80% of the purchase volume is evaluated according to an applied, cross-functional supplier evaluation systematics.	More than 80% of the purchase volume is evaluated according to an applied cross-functional supplier evaluation systematics.
Communication with suppliers	**Are evaluation results communicated to suppliers? On a regular basis?**		Evaluation results are sporadically communicated to suppliers (e.g. during price negotiations).	Evaluated suppliers are promptly informed about the evaluation results. Results are internally recorded (e.g. central database).	Evaluation results are discussed with selected suppliers in a cross-functional team.	Evaluation results are discussed with selected suppliers under involvement of the management.

Responsibility	**Do you have a Supplier Management function in your organisation?**		Supplier Management function is hardly existing.	Function is documented and implemented.	Function is implemented as described and is actively managing the Supplier Management processes.	Function is an established interface between cross-functional partners and purchasing, drives application of agreed supplier strategies and reports relevant results (e.g. cost reduction, contribution to business).
Supplier development (PO4)						
Process	**Is there a systematic procedure for Supplier Evaluation in place? Is the process described and communicated within the company?**		Supplier development measures are defined individually.	A planning process is existing for all substantial suppliers.	The supplier development process is defined. Supplier development plans are derived from the supplier evaluations and are implemented.	Development process is implemented and regularly updated. Development plans are harmonised across the organisation and derived from the supplier development strategy. Communication of all results is ensured.
Optimisation	**Do you visit the sites of your supplier on a regular basis? Do you perform trainings and workshops with your suppliers?**		Selective visits at suppliers.	Periodical realisation of trainings and workshops at the supplier.	On demand internal/external resources are available to support projects, training and implementation.	Professional consulting project and trainings take place. Resources for consulting are permanently provided for respective project. Joint continuous measurement of development success with suppliers.
Phase-out	**How would you describe the supplier phase out process? Who decides about phase out?**		Suppliers will be phased out based on subjective criteria.	Responsibilities for phase-out decisions are defined.	Phase-out strategy exists. Process with defined criteria is described.	Consequent application of phase out strategy, cross-functionally agreed.
Purchasing early involvement in Development process (PO5)						
Process	**Does the process follow a documented path? Are tasks and responsibilities well defined within the overall process?**		There is no early purchasing involvement process existing. Purchasing is not considered within the product development process.	Processes of early procurement involvement are described, responsibilities defined. Involvement and tasks of purchasing are documented within the product development process.	Processes of early procurement involvement are synchronised with the product development process. Responsibilities are clearly documented. Process targets are defined and responsible persons are measured at these targets.	Product development processes are compared and continuously improved by benchmarks of business units/other companies.
Cross-functional integration	**How is purchasing involved in the product development process?**		Purchasing is sometimes invited to team meetings by the engineering team.	Purchasing is an integrative part of the cross-functional engineering team during the design phase.	Purchasing is an integrative part of the cross-functional engineering team during the concept phase.	Purchasing is actively involved in the idea phase (e.g. concept workshops) and supports product- and program planning in respect to feasibility of product ideas.
Standardisation	**Does purchasing pursue consequently measures to reduce complexity of products, processes and sourcing procedures?**		Standardisation is not consequently considered within the product/project development process.	Purchasing influences consequent reduction of unnecessary complexity of components, processes and sourcing structures.	Defined standards (e.g. modules, component catalogues), suppliers per product/service resp. technologies are applied.	Basic concepts of standardisation (e.g. product platforms, modules) are defined cross-functionally together with purchasing.
Material/functional release	**Has purchasing any impact on material/functional release?**		Purchasing remedially determined material/functional release.	Material-/functional release occurs cross-functionally by engineering, quality and purchasing.	Purchasing is an integral part of material/functional release process and driver for 2nd Source.	Purchasing monitors and improves materials/functional release procedure based on jointly agreed targets together with partners.
Early supplier involvement Process (PO6)						
Early supplier Involvement	**To what extent are suppliers incorporated into the phases of product development?**		Less involvement of suppliers.	Suppliers provide regular focused and comprehensible input. Preliminary value added stages are explicitly considered.	Suppliers are systematically involved following a defined process. Development capacity of the supplier (resident engineer) is used on demand.	Suppliers are integrated on the basis of total cost of ownership criteria. Simultaneous engineering/joint project management with the supplier occurs on demand.
Technology roadmaps	**For which suppliers do you have their technology roadmaps accessible?**		Technology- and market strategies of the own product and service portfolio are known.	Technology- and market strategies of the suppliers' product and service portfolio are known.	Technology and market strategies of the suppliers' product and service portfolio are known and occasionally adapted to own ones.	Technology and market strategies of the suppliers' product and service portfolio are mutually adapted in substantial commodity groups.
Process involvement with other functions (PO7)						
Involvement marketing	**Is purchasing acquainted with marketing strategies and relevant markets? Is purchasing familiar with key customers?**		Marketing strategies are known in purchasing. Integration depends on single persons.	Existing and future marketing strategies are known in purchasing,	Purchasing influences marketing strategies or sales prognosis by provision of procurement market know how following a regular process.	Purchasing is integrative part in the development of marketing strategies and sales prognosis.

Involvement quality	**Is quality management included in the supplier selection process? Do purchasing and quality department form one face to suppliers?**		Integration of purchasing depends on single persons. Integration occurs incidentally, criteria for integration are not existing. Quality management is subject to quality department.	Purchasing supports the quality department in quality related issues resp. supplier issues (e.g. claim and extra expenses cases). Interfaces established.	Integration and tasks of purchasing into the quality management system. Responsibilities and tasks of purchasing are clearly described. Resources with respective quality competence are existing in purchasing.	Quality engineering function is established in purchasing. Suppliers are integrated into the quality management system and carries out quality improvement programs together with the quality department.
Involvement logistics and production	**How and to what extent is the procurement logistics/material handling process defined?**		Inbound logistics processes are unstructured and not or only partially documented.	Logistics processes are structured, documented and implemented. Tasks of operative procurement are described within het logistics processes. Escalation model (e.g. troubleshooting for missing parts) is described.	Processes are regularly reviewed and improved. Purchasing is involved with all product ramp-ups and phase-outs as well as into the change management procedure.	Logistic processes describe the applied sourcing models. Purchasing drives activities along the value chain and is integrated at each phase.
Logistics targets	**Are there and if so, what are the joint targets between purchasing and material handling/logistics?**		Logistics targets are known to purchasing and sometimes part of supplier negotiations.	Logistics targets are partially known to purchasing and are considered in supplier negotiations.	In the regular process, logistics agreements are concluded together with logistics department at substantial suppliers.	Logistics targets are defined jointly with logistics, continuously updated and implemented.
Involvement operative procurement	**Are agreements of strategic purchasing known by operative procurement? Is a consisted information exchange ensured between both departments?**		Agreements of strategic purchasing are not known to operative procurement and vice versa.	Agreements of the strategic purchasing are known to operative procurement. Information exchange between the departments is ensured.	Strategic and operative purchasing systematically exchange important subjects about suppliers (approach, agreements, problems). Agreements with suppliers are known to operative purchasing and are implemented.	Strategic agreements with the supplier are fully implemented by operative procurement and are complied. Topics of operative procurement are agreed with suppliers by strategic purchasing.
Involvement risk management	**Is risk management an integral part of the purchasing process?**		Less involvement of purchasing.	Responsibilities within purchasing are clearly described and communicated to the employees.	Involvement and tasks of purchasing at the risk management process are described. Implementation follows widely the process description.	Risk management is an integrative part of the purchasing process. Cross-functional involvement ensured and documented.
4. Human Resources and Leadership in Procurement (HR)						
Job description and competencies (HR1)						
Functions	**Are key functions described in a generic way?**		Individual purchasing functions are described in general.	Substantial purchasing functions are standardised described, documented and adapter to firm strategy.	Purchasing functions are described in detail and agreed with cross-functional partners. Descriptions of purchasing functions are standardised at all sites.	Developments/ tendencies of job profiles are observed and forwarded for review on group level.
Technical competence	**Is there technical competence available in purchasing? Are designated competences available (e.g. Advanced Sourcing Engineer)?**		Partial existence of technical competence, further development is planned.	Technical competence in purchasing is existing for all substantial commodity areas.	Technical competence in purchasing is existing for all substantial commodity areas. Project management competence in purchasing is sufficiently developed for efficient collaboration with project teams.	Competencies for all substantial commodity areas are existing and will be continuously developed, remedial and temporary introduction of special knowledge (e.g. consultants).
Personnel selection and integration (HR2)						
Selection	**On which methods/ systematics is the recruiting process based on? Is recruiting executed in a systematic and structured manner?**		Recruiting is mainly based on experience.	Recruiting is based on generally described purchasing job profiles.	Recruiting occurs methodically, structured and is aligned to the vacant purchasing function.	Recruiting occurs on the basis of a competence mode. Structured interviews on the basis of standardised interview questionnaires with systematic and cross-functional analysis of results.
Integration	**Are training plans available? To what extent?**		Training plans are under development.	Training plans exist for few functions. Supervisor/Coach is defined.	Systematic integration based on training plans with defined checkpoints. Availability for substantial purchasing functions.	Cross-functional training plans are enhanced by target agreements. Feedback dialogue after completion of integration period.
Performance appraisal & Career development (HR3)						
Target agreements	**Are targets defined on employee level? To what extent? Do targets contain qualitative and quantitative elements?**		Target agreements on the non-managerial level is not existing.	Occasional finalisation of target agreements on the non-managerial level. Target agreements include qualitative and quantitative targets.	Target agreements finalised with the complete staff. Continuous support and review.	Target agreements are coordinated and defined with cross-functional partners if necessary, reviewed during the fiscal year.
Career development	**Are there regular conversations in respect of employee development? Is there a structured process to identify potential candidates?**		There are no conversation in respect of employee development.	Unregular exchange with potential candidates.	Annual structured review of potential candidates and initiation of development measures.	Group/Regional wide review of potential candidates and introduction to the company procurement network.
Feedback process	**Is there a formal and regular procedure of monitoring and feedback established?**		There is no feedback procedure in place.	Remedial request of single feedback from employees.	Application of the available human resource instruments and remedial feedback of cross-functional partners.	Annual employee dialogue of employees with purchasing department manager. Cross-functional, regular feedback with process partners (e.g. workshops, customer satisfaction surveys etc.). Bottom-up feedback established.

5. Purchasing Controlling (CO)						
Controlling systems (CO1)						
Target result definition	**Are the targets for the purchasing function derived from the business plan of the group? Is purchasing involved in defining its targets together with executive management?**		Purchasing targets are derived isolated out of business planning targets.	Purchasing targets are derived from the business planning targets under involvement of purchasing. Targets are not cross-functionally agreed.	Purchasing is comprehensively involved in the target setting of the business unit planning process. Purchasing targets are partially cross-functional accepted based on rolling forecasts.	Purchasing is significantly involved in the target setting of the business unit. Input out of procurement markets are considered in the planning process. Impact of purchasing targets in business results are integrated in the budget and rolling forecast.
Target break-down	**How are targets broken down? Are they detailed on employee-level?**		There is no structured target breakdown in place.	Single financial results hard performance figures are defined and remedially reviewed.	Substantial financial results and performance figures are defined and are reviewed regularly.	Targets are broken down and structured based on scorecard targets (e.g. processes, finance, customer/market, employee/knowledge/innovation) and reviewed regularly on the basis of rolling forecasts.
Measurement figures	**Are measuring parameters defined?**		Only limited target follow-up based on existing performance figures possible.	Substantial performance figures (e.g. balanced scorecard) are implemented.	Group-wide mandatory performance figures are completed by own ones for particular areas.	Performance figures for all scorecard targets are continuously and cross-functionally defined.
Controlling process & Structure (CO2)						
Organisational structure	**Is the function of planning and steering available and established? Are the planning and steering tasks of purchasing clearly defined and documented?**		Planning and controlling function for purchasing controlling is not existing.	Planning and controlling function for purchasing controlling is existing.	Planning and controlling tasks of purchasing are described and implemented as an own function with defined processes.	Planning and controlling tasks of purchasing are applied as described and are integrated into the operative controlling processes of the business unit.
Responsibility	**Are roles and responsibilities clear and described?**		Tasks and responsibilities are insufficiently described.	Tasks and responsibilities are sufficiently described.	Tasks and responsibilities are described according to requirement profiles and are applied.	Tasks and responsibilities are included in an superior controlling guideline of the business unit. Implementation mandate for agreed standards in purchasing controlling is established.
Target controlling process	**How are deviations from plan handled?**		Target-/Actual-comparisons are unregularly applied.	Target-/Actual-comparisons are regularly applied. Necessary correction measures initiated partially.	Target-/Actual-comparisons are applied on the basis of rolling forecasts. Correction measures are consequently implemented.	Business results of the identified measures are reviewed and documented.
Measurement controlling process	**Is there a structured procedure for controlling measures/actions/activities? Do you have the degree of implementation logic (or any other, e.g. milestones) in order to track the realisation progress?**		Results relevant measures are hardly tracked.	Measures are tracked regularly.	Measures are regularly tracked by the degree of implementation systematic or similar.	All measures are systematically tracked based on their impact on business results. Supervision of measurement implementation by business unit management.
Controlling Methods & Tools (CO3)						
Commodity codes	**Do you classify your materials to any kind of commodity code (e.g. ecl@ss)?**		Commodity code classification only for selected commodity areas.	Correct and complete commodity code classification for "direct material" is ensured.	Commodity code is defined as a mandatory data field for order release. Continuous revision of wrong commodity code classifications.	Correct and complete commodity code classification is ensured for the total purchase volume.
IT Support	**Are you able to perform spend analysis? On what level of automation?**		Purchasing volume is available only for the local ERP-systems.	Purchasing volume is generated by calculating according to a group-wide accepted method and can be retrieved to a specific purchasing needs.	Regular provision of purchase volume in a central database (e.g. purchasing information system.	Availability of all purchasing volume data in a central database on a monthly basis and active support of standardised supplier number matching process.

Model of H. Schiele used as baseline. Please refer to Supply-management maturity, cost savings and purchasing absorptive capacity: Testing the procurement–performance link. Journal of Purchasing & Supply Management 13 (2007)

B.5 Bemelmans et al. (2013)

Figure B.1 shows the graphical representation of the quick scan purchasing maturity tool developed by Bemelmans et al. (2013). Please refer to this research for the definitions of the 20 characteristics.

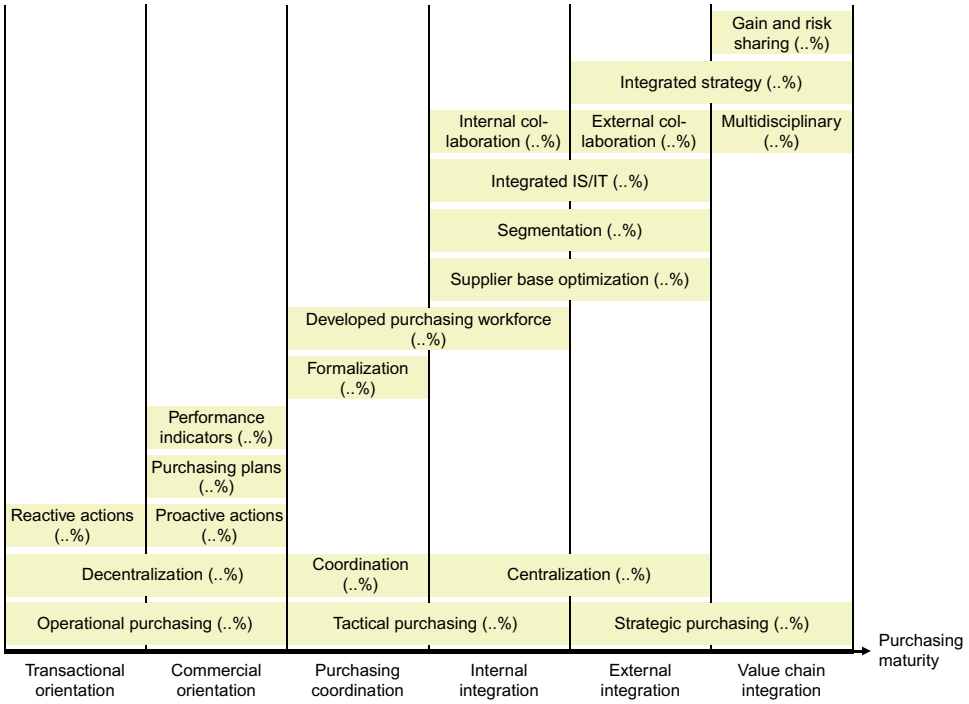

Figure B.1: Graphical representation of the quick scan purchasing maturity tool developed by Bemelmans et al. (2013)

Appendix C: Tech Deployment in Procurement

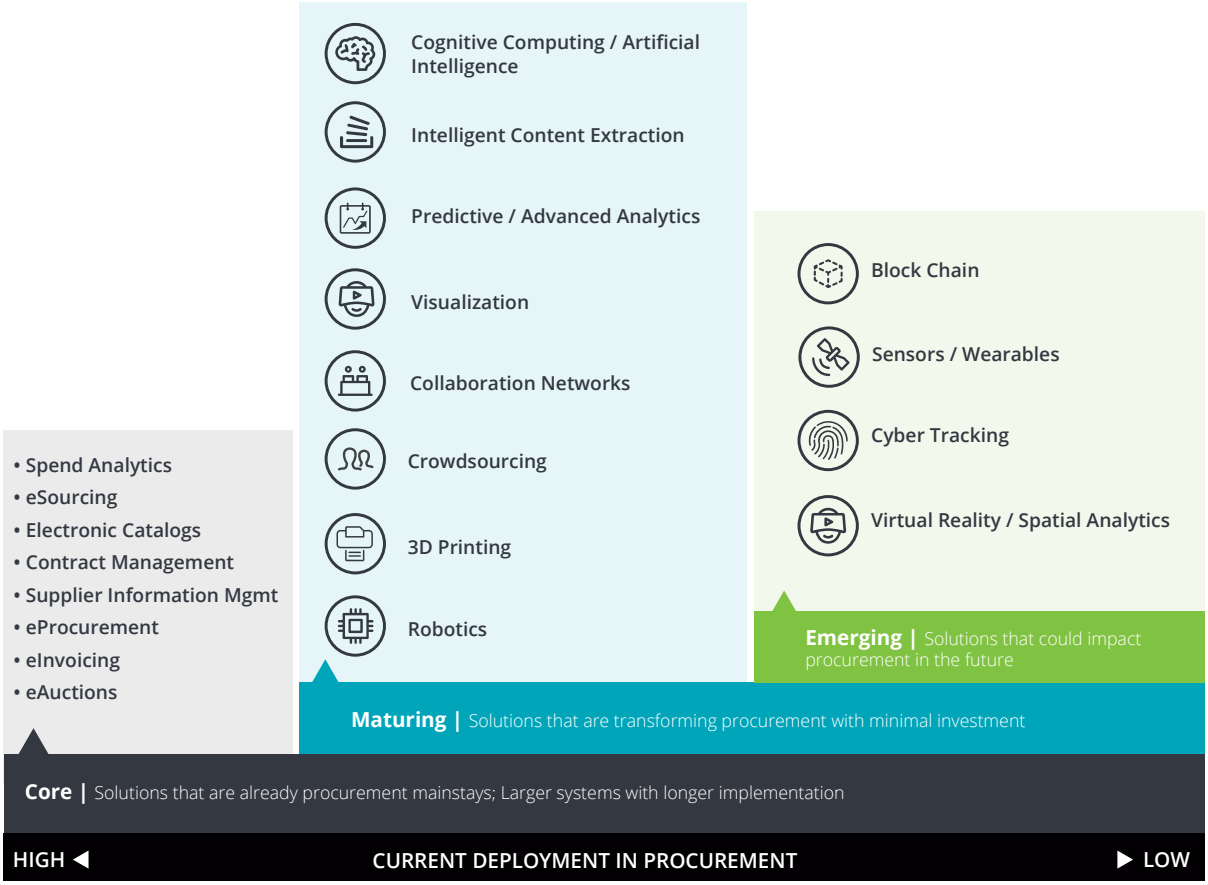

Figure C.1: Current digital technologies and the degree of deployment in procurement Daher et al. (2017)

Appendix D: Organisational Aspects

D.1 Cross-Functional Structure

The *Corporate Group* is operating in an era where technology enables organisations to coordinate their activities through complex projects with dispersed specialists, often spanning boundaries of time and culture (Newell, Robertson, Scarbrough, & Swan, 2009). Organisations are becoming increasingly flexible and the primary source of competitive advantage is usually innovation. Without the intention to generalise or to be narrow-minded, the *Corporate Group* is most likely no exception to these trends. The organisational chart presented in Chapter 4 clearly shows the form of a matrix, which emphasises the cross-functional integration of the PEx structure. Employees are managed on a team basis (functional) as well as a regional basis (divisional). The team dynamic is organic, entailing that cross-functional teams work decentralised, experience a low form of formalisation and have a free flow of information and wide spans of control (Newell et al., 2009). It is a typical structure for multinational companies and very effective because a culturally diverse geographically distributed group of people is brought together to collaborate. Communication and coordination are mostly done through electronic means rather than by face-to-face interaction. This way of working was already familiar to many within the *Corporate Group* and is quite beneficial considering the current COVID-19 situation.

The objective of the PEx team is to encourage a faster response rate and reduce lead times considerably, while people are also more aware of what is going on. This is realised by driving innovation and the adoption of technology. To prevent manual and tedious labour, digital tools are embedded in the procurement process which either eases the work of employees or improves their capabilities. Cross-functionality is already embedded in the maturity profile instrument but it certainly is an element to be considered when extending the model with e-procurement.

D.2 Category Management

As mentioned earlier, a few years ago the *Corporate Group* adopted Category Management (CM). Dussart (1998) provides several definitions where the following one would fit best with the *Corporate Group*'s implementation: "Category management is a distributor/supplier process of managing categories as strategic business units, producing enhanced business results by focusing on delivering consumer value". CM has two main strategic objectives:

1. To define the basic business unit as the product category, contrary to specific brands or product lines.
2. To customise marketing as closely as possible to local shopping patterns.

The products and brands that belong to a certain category are related and a decision about one brand or product usually has an impact on the other ones in the category. Therefore, decisions should be made according to the goals and criteria of the category and not just based on a sole item or brand. Category management attempts to achieve a marketing approach based on geolocation to meet the needs of local retailers while also complying with the corporate global strategy. CM is a large part of the company structure since it requires alignment across all the different layers (Corporate, Global, Regional, Local). It is not embedded in the maturity profile instrument while it touches upon topics such as communication and cross-functionality. On first notice, it seems CM should be taken into account when describing the stages in the extension.

D.3 Change Management

Change management is a term that is used quite often within the *Corporate Group* and it refers to the impact of organisational transition on people and teams. Today, it entails several disciplines aiming to drive the adoption of innovation and technology through project initiatives. Change management is a concept that can be divided into two aspects, leading change and facilitating

change (Sabri, Gupta, & Beitler, 2007). The latter is less interesting because it focuses on the capabilities of external parties. Facilitating change usually means an external (independent) consultant guides the process of change. Leading change, however, is the top management's responsibility to be familiar with the content and company-specific issues related to change. This can be translated to how new technologies and tools are acquired, how company-wide adoption is ensured but also how top management attempts to gain and maintain a competitive advantage.

Hornstein (2015) emphasises that it is a business imperative for organisations to use project-based initiatives as levers for organisational change to ensure success. Effective change management and leadership have proven to significantly influence the successful implementation rates of organisational initiatives and projects. The number of business projects that incorporate change elements has been increasing through the years. Although organisational change is usually related to technology and innovation, it involves so much more than following a technical process. Introducing technology is just the start of a long and intensive process and it certainly won't be sufficient to solve issues in the short term. This ties into the concept of purchasing absorptive capacity. Therefore, change management could be part of the extension.

Appendix E: Interview Outline

Each interview started with an introduction, an explanation of the research and the reason for the interview. It was carefully explained to the interviewee how the data would be stored and processed. The interview was only recorded after the interviewee provided consent. This was done to comply with the TU Delft rules and General Data Protection Regulation (GDPR). It was agreed upon that the interview will be summarised and verified afterwards with the interviewee to confirm whether everything was understood as intended to be. Recordings have been deleted after the interview summary was confirmed by the interviewee.

The interview outline can be seen in Table E.1. The topics explanation, introduction and maturity profile instruments were discussed with all the interviewees. The other topics were for a specific interviewee. Besides the topics and questions shown below, additional questions were thought off and asked on the spot.

Table E.1: Interview outline

Topic	#	Question
Explanation	1.1	Provide background information about the research study.
	1.2	Explain the reason and contents of the interview.
	1.3	Explain how the data and recording will be stored, used and managed.
	1.4	Do I have your consent to record the session?
Introduction	2.1	Could you introduce yourself?
	2.2	What is your function within the company?
	2.3	What are prior experiences before your current role?
Definitions & process description	3.1	How do you define TOPIC?
	3.2	How is the team's structure and what are the responsibilities?
	3.3	How do you describe the process?
	3.4	Which tools and/or systems are in place and what is their relation and value to the process?
	3.5	What is the company doing well procurement wise and what should be done better?
	3.6	Have there been any recent changes that resulted in process improvement or deterioration?
Framework	4.1	Do you understand the instrument and if not, what is not clear to you?
	4.2	What are according to you the most critical aspects of the procurement process?
	4.3	What do you think about the split of the five different dimensions?
	4.4	What do you think about the sixth dimension?
	4.5	Which (sub)functions are critical to maturity assessments of each dimension?
	4.6	Which (sub)functions are out-dated or obsolete?
Functions & stages	5.1	In case the TOPIC is already (partly) embedded in the model, what are you missing?
	5.2	How would you assess the maturity of a Region or OpCo regarding TOPIC?
	5.3	Which functions are critical to maturity assessments of TOPIC?
	5.4	Which questions should be asked regarding these critical functions?
	5.5	How would you define the four stages for each function?
	5.6	What is the maximum an organisation can achieve and should strive for?
	5.7	What are the variables that change per stage for this certain function?
	5.8	Where is the distinction between the assessment of the company and the category/region/OpCo?
Synopsis	6.1	Did the interview manage to touch upon a full extension of TOPIC?
	6.2	Would you be willing to review the model after the interview?
	6.3	Are there internal documents available that could support or be an addition to the stage definitions?
Verification	7.1	Are there any remarks or comments regarding the interview summary or proposed model?
	7.2	In hindsight, does the model cover TOPIC entirely for proper maturity assessment?

Appendix F: Ethics Review for Human Research

Delft University of Technology
ETHICS REVIEW CHECKLIST FOR HUMAN RESEARCH
(Version 12.03.2021)

I. Table 1: Risk Assessment Checklist

Note: *if you answer "yes" to any of the questions in this checklist, please ensure that you summarise and confirm how these will be dealt with in Section IV (Risk Management and Informed Consent) below. Where appropriate please include the relevant advice/approval (eg: from the Privacy Team, Data Steward or HSE representative) as an additional attachment to this application.*

Potential Risk	Yes	No
1. Does the study involve participants who are particularly vulnerable or unable to give informed consent? (e.g., children, people with learning difficulties, patients, people receiving counselling, people living in care or nursing homes, people recruited through self-help groups).		X
2. Are the participants, outside the context of the research, in a dependent or subordinate position to the investigator (such as own children or own students)?[1]		X
3. Will it be necessary for participants to take part in the study without their knowledge and consent at the time? (e.g., covert observation of people in non-public places).		X
4. Will the study involve actively deceiving the participants? (For example, will participants be deliberately falsely informed, will information be withheld from them or will they be misled in such a way that they are likely to object or show unease when debriefed about the study).		X
5. Will the study involve discussion or collection of personal sensitive data (e.g., financial data, location data, data relating to children or other vulnerable groups)? Definitions of sensitive personal data, and special cases are provided on the TUD Privacy Team website.		X
6. Will drugs, placebos, or other substances (e.g., drinks, foods, food or drink constituents, dietary supplements) be administered to the study participants? *If yes see here to determine whether medical ethical approval is required*		X
7. Will blood or tissue samples be obtained from participants? *If yes see here to determine whether medical ethical approval is required*		X
8. Is pain or more than mild discomfort likely to result from the study?		X
9. Does the study risk causing psychological stress or anxiety or other harm or negative consequences beyond that normally encountered by the participants in their life outside research?		X
10. Will you be offering any financial, or other, inducement (such as reasonable expenses and compensation for time) to participants?		X
Important: if you answered 'yes' to any of the questions mentioned above, you **MAY** be asked to submit a full Research Ethics Application.		

[1] **Important note concerning questions 1 and 2.** Some intended studies involve research subjects who are particularly vulnerable or unable to give informed consent. This includes research involving participants who are in a dependent or unequal relationship with the researcher or research supervisor (e.g., the researcher's or research supervisor's students or staff). If your study involves such participants, it is essential that you safeguard against possible adverse consequences of this situation (e.g., allowing a student's failure to complete their participation to your satisfaction to affect your evaluation of their coursework). This can be achieved by ensuring that participants remain anonymous to the individuals concerned (e.g., you do not seek names of students taking part in your study). Please ensure that you include such risks – and how you will mitigate against them in your risk section.

Potential Risk	Yes	No
11. Will the experiment collect and store any personally identifiable information (PII) including name, email address, videos, pictures, or other identifiable data of human subjects? [2]		X
12. Will the experiment involve the use of devices that are not 'CE' certified? *Only, if 'yes': continue with the following questions:*		X
➢ Was the device built in-house?		
➢ Was it inspected by a safety expert at TU Delft? (*Please provide a signed device report*)		
➢ If it was not built in house and not CE-certified, was it inspected by some other, qualified authority in safety and approved? *(Please provide records of the inspection).*		
13. Has this research been approved by a research ethics committee other than this one? *If yes, please provide a copy of the approval and summarise any key points in your Risk Management section below.*		X
14. Is this research dependent on a Data Transfer Agreement with a collaborating partner or third party supplier? *If yes please provide as a copy of the signed DTA and summarise any key points in your Risk Management section below.*		X

[2] Note: You have to ensure that collected data is safeguarded physically and will not be accessible to anyone outside the study. Furthermore, the data has to be de-identified if possible and has to be destroyed after a scientifically appropriate period of time. Also ask explicitly for consent if anonymised data will be published as open data.

Appendix G: Interviews

Topic outline

- D1: Overall Framework (04/03/2021)
- D2: Indirect Spend Management (03/03/2021)
- D3: Procurement Excellence (23/03/2021)
- D4: Procurement Technology & Sourcing Activities (09/04/2021)
- D5: Spend & Data Management (28/04/2021)
- D6: Contract Management (28/04/2021)
- D7: Market Intelligence (05/05/2021)
- D8: Transactional Procurement (30/04/2021)
- D9: Supplier Relationship Management (29/04/2021)

G.1 Overall Framework

Subject: Framework of Overall Maturity Assessment Instrument
Organisation: *Entity A*
Interviewed by: Menno van Dijk
Interview date: March 04^{th}, 2021 and March 11^{th}, 2021
Transcribed by: Menno van Dijk
Summarised on: April 13^{th}, 2021
Summary confirmed by the interviewee on: April 30^{th}, 2021
Interview Type: Video interview using Microsoft Teams

G.1.1 Discussing the company and explaining the maturity instrument

After the consent was given, the interview started with a short introduction of the interviewer's background and was followed by the background of the interviewee. This was purely asked because of personal interest, but it won't be documented to prevent any privacy issues.

Company's procurement process
For *Entity A* it is mainly the difficulty of several companies growing together. The maturity levels of the organisations are quite different, mainly due to the difference in the size of the company (number of people, amount of spend, production capacity). One of the OpCos for example, is large enough to have a corporate overhead while others are too small. However, without the corporate overhead, the smaller companies barely make any distinction between the operational and strategic level. A lot of labour-intensive tasks are done manually in Excel files while the use of an automated process would be preferred. Thereby, there is barely any evaluation of the status quo.

On an operational level, it should be going towards a fully automated system. On a strategical level, it is all about alignment and structured data. What are the purchasing goods? What are the categories? How much spend is there in the system? How are the purchases processed (PO, Sourcing tool)? When people are mainly used to work on an operational level, it is hard to have that creativity to adopt, explore and develop the new system. Despite the major differences in maturity, these companies now have to grow together and find a common way of acting. An example of these efforts is that *Entity A* is going to create a structure by adopting the *Corporate Group* category management and make a clear distinction between direct and indirect spend.

After the discussion on *Entity A*'s procurement, the maturity instrument was shown and explained.

The five different dimensions
The first dimension, Procurement planning, has a misleading name and should be probably called Strategic planning. The fourth dimension Human Resources and Leadership seems to be quite high-level. This mainly involves the corporate layer which is not necessarily limited to procurement. Although it does affect the purchasing performance, it seems to be obsolete. The other dimensions are fine, but perhaps should also include the procurement excellence team of the *Corporate Group*.

When assessing the maturity instrument, it became quite clear it is fairly large. Logically, it took quite some time to explain the framework. Therefore, a second interview was scheduled to discuss the tool in-depth. The interviewee took the time between the two interviews to review the to fully understand its framework. Based on this review, possible adjustments and obsolete functions were discussed.

G.1.2 Reviewing the Maturity Instrument

Each dimension was reviewed to determine the most critical domains and functions and which ones could be considered obsolete.

1. Procurement Planning (PL)
Since the interviewee had the time to review the model, a change of the dimension name was not considered to be logical anymore. However, the domain Demand Planning (PL1) and its functions "Process" and "Assessment of Demand" were still considered to be vague and unclear. Therefore, they should be specified.

Environment Scanning (PL3) and its three functions are not relevant for purchasing performance. However, the market intelligence team of PEx is working on market analyses and commodity reports. Perhaps the main function can be reduced to one question about the usage of information provided by the market intelligence team.

2. Organisational Structure of Purchasing (OS)
The domains and functions in the organisational structure of purchasing are considered to be very relevant. However, the interviewee proposed to add another function regarding direct and indirect spend management. This will be further described in the interview about indirect spend management.

Another aspect the interviewee was missing is the split between strategic/tactical purchasing and transactional purchasing. The entire procurement process is divided into these exact two categories.

3. Process Organisation (PO)
The first function from Strategic Sourcing (PO1) is rather vague since it tries to assess the Sourcing Strategy by asking how the sourcing strategy of the company can be described. However, the interviewee argues there is not just one strategy. This has to be probably be rewritten to match with the tactical part of procurement and the corporate sourcing department. The interviewee proposed to redefine the question to "How is the sourcing strategy determined?". The corresponding stages are already going in a good direction but they should be specified a little bit. The fourth stage contains the following sentence: "Key issues of the competitors' sourcing strategies are known and documented". This should be removed since it is either not possible to have that kind of information or it brings along compliance issues.

Then the second main function Supplier selection (PO2) contains the function Contract Management. According to the interviewee, this is in the focus of the central team and therefore not applicable for *Entity A* or must be mirrored somewhere in the potential answers.

The seventh main function called Process involvement with other functions (PO7) includes the function Involvement marketing. This should be related to a marketing department and not the procurement division. The interviewee proposed to delete this function.

4. Human resources and leadership in procurement (HR)
The interviewee found the fourth dimension regarding human resources and leadership in procurement (HR) most problematic because it is more related to the entire organisation and of a lesser impact on procurement. It is quite generic and could apply to all departments without being too different from each other. According to the interviewee, it should be taken out completely to reduce complexity given its low impact on the maturity assessment. However, after a short discussion, it was agreed the answers probably could differ per region within *Entity A* and it could be valuable for benchmarking among other organisations.

In order to still assess the maturity of the HR dimension but reduce the complexity of the model, the interviewee proposed to take out the following domains and functions: the domain Personnel selection and integration (HR2) and the function Career development within Performance appraisal & Career development (HR3).

5. Purchasing Controlling (CO)
The second domain called Controlling process & Structure (CO2) contains the function organisational structure. The interviewee considers this function to be obsolete. The Measurement controlling process is another one within CO2 and is defined as rather vague. It should either be more specific or removed from the instrument.

G.1.3 Verification

This summary was sent to the interviewee for confirmation. The interviewee did not propose any additions or adjustments regarding the model. However, two sentences in the summary have been slightly adjusted based on the feedback.

G.2 Indirect Spend Management

Subject: Indirect Spend Management
Organisation: *Entity A*
Interviewed by: Menno van Dijk
Interview date: March 03^{rd}, 2021
Transcribed by: Menno van Dijk
Summarised on: March 19^{th}, 2021
Summary confirmed by the interviewee on: March 31^{st}, 2021
Interview Type: Video interview using Microsoft Teams

G.2.1 Interview

After the consent was given, the interview started with a short introduction of the interviewer's background and was followed by the background of the interviewee. This was purely asked because of personal interest, but won't be documented to prevent any privacy issues. Before talking about indirect spend within the maturity assessment instrument, the interviewee was asked to define the different types of spend.

- Direct spend: All services and goods which are directly related to manufacturing and thus put into the sales product.
- Indirect spend: All services and goods which are not related to manufacturing and thus not directly put into the sales product.

Thereafter, the maturity assessment instrument was explained to discuss how to implement indirect spend within the assessment. The following comments were provided by the interviewee based on seeing the maturity assessment instrument:

- The first step is to understand how indirect spend is defined within an organisation and the corresponding category structure behind it. It is important to know which commodities and categories belong to indirect spend and which does not.
- Indirect spend is related to the eP2P capabilities of a company.
- Ensuring clear spend management is also important for the procurement department. The procurement data warehouse (PDW) is part of this but not fully covering the function. Although the PDW gives insight into spend trends, there is sometimes a lack of a clear category structure. This is partly due to the many different ERP systems. In order to ensure clear spend management, it is proposed to use one tool without continuously switching to alternatives

Functions, questions and stages
Thereafter, the current model was reviewed to improve regarding indirect spend. Currently, there is no assessment of both direct and indirect spend. The dimension organisational structure of purchasing would be the best fit to include such an assessment. The interviewee was asked

which key functions there are to assess indirect spend and what the corresponding questions and stages are. The main topics, questions and stage definitions in order to assess indirect spend management were proposed as follows:

- **Understanding and awareness**: How is the indirect spend defined and perceived in the company?
  - Stage 1: No definition and low awareness.
  - Stage 2: Company definition but disagreement among responsible people.
  - Stage 3: Clear definition and people are aware.
  - Stage 4: Clear definition, barely any exception and people acknowledge the importance.
- **Communication and Interaction**: How is the communication and interaction between the indirect spend manager of *Entity A* and the different categories? How is the responsibility divided regarding indirect spend?
  - Stage 1: Low interaction and communication.
  - Stage 2: Interaction between several categories and OpCos.
  - Stage 3: Significant interaction but no facilitator.
  - Stage 4: Full interaction between categories and OpCos.
- **Purchasing process**: How do you buy indirect goods and services?
  - Stage 1: Purchases are done offline, no difference direct or indirect spend.
  - Stage 2: There is a difference between direct and direct. Purchases are done both offline as online.
  - Stage 3: Clear difference between direct and indirect. Purchases are done mostly online.
  - Stage 4: If possible, purchases are done online. The majority is bought via an e-catalogue.
- **Spend management approach**: How is the approach for spend management and which tools are used?
  - Stage 1: Unclear approach to manage spend. Multiple tools are used and the origin of data is unreliable.
  - Stage 2: There is a main tool but additional tools are needed. The origin of data is known but data is presented inconsistently and missing details.
  - Stage 3: There is a main tool but still requires support from another tool. Data is coming from one source, containing a sufficient amount of details.
  - Stage 4: Clear approach to manage spend using only one tool while presented in a standardised manner.

G.2.2 Verification

This summary and the extension of indirect spend within the maturity model have been shown to the interviewee for confirmation. It was well received and the interviewee confirmed the key points were covered to assess indirect spend and to improve and create a better process. However, the following improvements were proposed to further enhance the maturity instrument:

- The function "Communication and Interaction" should be renamed into "Communication and Responsibility" and then split into two questions which each of their own stages. The first one is proposed to be: "How is the communication and interaction between the different *Corporate Group* categories and *Entity A*'s Opco?". The second one is proposed to be: "How is the responsibility divided for the OpCos regarding indirect spend?".
- Communication and Interaction. The stages should be slightly adjusted. In stage 4, there should be a "coordinator", the indirect sourcing manager of *Entity A*, for the interface between OpCos indirect purchasing department and the *Corporate Group* CatMan. In Stage 1-3, there is no coordinator yet who can transport and consolidate this data to both parties (OpCos and the *Corporate Group* CatMan).
- Responsibility. The other remark was about identifying the Non-Product Related (NPR) buyer within an OpCo. The appropriate person is not always assigned as the NPR buyer is. Sometimes the wrong person is listed as the NPR buyer, preventing clear communication between the involved parties.

G.3 Procurement Excellence

Subject: Procurement Excellence
Organisation: *Corporate Group*
Interviewed by: Menno van Dijk
Interview date: March 23^{rd}, 2021
Transcribed by: Menno van Dijk
Summarised on: April 19^{th}, 2021
Summary confirmed by the interviewee on:
Interview Type: Video interview using Microsoft Teams

G.3.1 Interview

P2P Survey

Recently a P2P survey has been conducted to provide an answer to the following question: "When we are going to implement e-P2P within the *Corporate Group*, what will be the order of implementation?". This for example depends on the maturity of an OpCo and, the kind of ERP system. *Entity A* is included as well and therefore, the interviewee thinks this survey could both be used to extend the maturity model as well as used to assess the maturity regarding the P2P process. It should be emphasised the survey is a self-assessment and the results might be impacted by potential self-evaluation bias contrary to the assessment by an external party. However, a first indication is provided.

One of the findings from the survey that was anticipated was the maturity of the approval flows and how they were currently structured. An approval flow is a matrix with names and spend limits either based on cost drivers such as a hierarchy or project. The differences between the approval flows among the organisations within the *Corporate Group* were significant. An ideal situation would be that the approval rights per person are documented and regularly updated. People are assigned an approval threshold for a certain spend-category or cost-driver (e.g. cost centre or project). However, the survey showed some organisations or departments only did this for the direct spend or they did not assign spend limits. Another important finding is the difference in KPIs of the P2P process or even the absence of KPIs.

Procurement Excellence

The *Corporate Group*'s organisation is based on a matrix structure. On the x-axis, the PEx department is divided into several divisions, with the biggest one Procurement Processes & Digitalisation. This division consists of the following teams: SRM, MI, e-sourcing, P2P and spend & data management. On the y-axis, these teams are also divided into regions to ensure

alignment between the teams in the same region. The main focus is to connect the different operating companies, the cluster heads and the different excellence teams. The following two questions summarise the focus of PEx: "How do we ensure the PEx ideas for and by the global teams, is the right fit for the operating companies?" and "How do we ensure the feedback and needs of the operating companies are processed by the suitable global teams?". It is up to the PEx team to find the right balance.

The current structure is fairly new since procurement excellence and procurement technology were the first two separate departments. The connection between the different topics has been improved through the new structure. An important element is change management. The work starts after the go-live of a project/program. People have to be aware, be reminded and understand the ongoing changes and how to deal with them, before and during the project delivery as well as after the project go-live.

P2P
The P2P process is defined as the process from the purchasing request until the payment in an as efficient manner as possible. The buyer should be able to easily do purchasing without any barriers or too much hassle.

The implementation of the e-P2P tool will increase efficiency and speed up the process. Although the efficiency is depending on user adoption, the partly automated approval flow is beneficial in two ways. The approval flow is quicker which increases the user adoption, plus payments can be done quickly which will most likely result in early payment discounts. Efficient, accurate and timely invoice processing is realised by streamlining the Accounts Payable process, automating manual work, eliminating paper. An increased level of touch-less processing (ambition 95% first-time match) leads to lower cost per invoice and the potential to improve working capital (early payment discounts/stretch days payable outstanding).

The purchasing functions to assess P2P should be similar to the ones assessed in the P2P survey. An alternative could be to divide the assessment of P2P maturity into the different P2P process steps. The process starts with a request (1), followed by approval (2) and the order (3), and when the goods/services are received (4), payment (5) will be made. The interviewee proposed several questions to assess the maturity of P2P: "What is the availability of P2P Data and the corresponding quality?" and "To what extent is the OpCo in control of the P2P process are these steps automated?".

Additional dimension in the maturity instrument
Initially, two additional dimensions were created, Procurement Excellence and Procurement Technology. The interviewee proposed to merge these two because it matches the organisational set-up resulting from the merge of these two teams. The main functions should then be the different teams within Procurement Excellence.

Additionally, the interviewee proposed to add the function of change management, which plays a big part in purchasing maturity. A few internal documents have been shared after the interview which are used to define the Procurement Excellence dimension.

G.3.2 Verification
Since the interview did not dive into the model, the interviewee only proposed several adjustments or additions to the summary. These are already processed above.

G.4 Procurement Technology & Sourcing Activities

Subject: Procurement Technology & Sourcing Activities
Organisation: *Corporate Group*
Interviewed by: Menno van Dijk
Interview date: April 09^{th}, 2021
Transcribed by: Menno van Dijk
Summarised on: April 12^{th}, 2021
Summary confirmed by the interviewee on: May 07^{th}, 2021
Interview Type: Video interview using Microsoft Teams

G.4.1 Interview

The interviewee was first asked to define e-sourcing. This was followed by asking how the procurement process is prioritised. According to the interviewee, the *Corporate Group* started with creating spend visibility, contract management and e-sourcing. These three are able to quickly gain advantages while also enabling a transparent process. A P2P tool is the next step to acquire compliance within the organisation.

1. **Spend visibility**. The procurement process starts with analysing the spend and creating a clear overview. In the case of one ERP system, you do not need an additional spend analytics tool. However, the *Corporate Group* is using dozens of ERP systems. Spend management influences the company decisions and is priority number one.

2. **Contract Management**. The second important step is to create a clear overview of your contracts through a contract management tool. This will help a company to answer questions such as "When does a contract expire?", "Which contracts will automatically extend?" and "Should we renegotiate some contracts?".

3. **E-Sourcing**. E-Sourcing is the digitalisation process of sourcing activities. A platform is used to interact with suppliers by sharing information and acquiring prices and specifications provided by suppliers. This is not only creating an excel sheet so suppliers can download the document, fill it in and upload it. This is labelled as "mailbox tendering" by the E-Sourcing team, and they strongly discourage their internal user base to take this approach as it results in a lot of manual work and is thereby limiting the additional value derived through the platform.

   E-Sourcing is more about creating line items to automate calculations such as cost savings/increase and analyse/compare the different inputs. Thereby, it also involves reducing the cost with the help of e-auctions, which have demonstrated to outperform traditional offline negotiation methods year-over-year in the *Corporate Group*, when it comes to average savings realized in a tender.

4. **P2P**. Since a tool will be acquired for e-P2P, the contracts will be moved from Ariba to Coupa. For more, see interview procurement excellence.

5. **Benefit/Initiative Tracking**. The last important aspect is benefit and initiative tracking. Currently, benefit tracking is done in Excel to predict possible saving opportunities for the category teams. This is mostly applicable to major procurement companies (Fortune 500) while local OpCos won't pay attention to this on a strategic level. There are tools to improve the tracking, but this is not a point of discussion yet.

Company's situation
It is most likely synergies within the organisation will show up. Although the different organisations were already part of the *Corporate Group*, they will probably be pushed more to think as one company and make better deals on a bigger scale.

The *Corporate Group* procurement process and its technologies
Essentially, the optimal procurement process is an infinite process, starting and ending with spend transparency. The process can be divided into a tactical part and an operational part. A transparent spend overview will identify savings opportunities that could kick start projects. Based on this, data will be collected to select and (pre)qualify suppliers for tendering. The tender process ends with final negotiations and then put into word and writing (contract). The contract will be processed and managed using the contract management tool. This is also the transition from the tactical part to the operational part.

The P2P tool ensures the entire organisation complies with the contracts. Buying channels are chosen to buy products via a certain catalogue and corresponding to this is an approval flow, depending on the product and price. A purchase order will be created after approval and the *Corporate Group* will commit to the spend of the purchase. The supplier will send an invoice and the goods/services will be received. When the purchase order, invoice and received goods/services, payment will be issued. Without a P2P it is still possible to do purchasing as agreed upon but is significantly harder to verify whether everyone does purchasing as is expected. The payment will then be processed in the contract management tool and affect the spend management.

This process is Procure to Pay (P2P) and each main function has its own technology behind it. According to the interviewee, spend transparency, contract management and e-sourcing are most significant. However, the P2P tool is currently in development and will also improve the entire process.

Maturity instrument
After the discussion about the procurement process, the maturity assessment instrument was shown to the interviewee. The opinion about the contents of procurement excellence was asked.

According to the interviewee, there are two ways to divide the procurement excellence dimension. Option one is to list the main functions (Spend Management, Sourcing, Contract Management etc.) as has been explained in the former section of this interview. Option two is to specially emphasise the technologies by grouping them within one function. The interviewee prefers option 1, clearly distinguishing the different procurement streams, which will also provide the chance to use technology to define the stage levels.

The following functions have been proposed as an addition to the Procurement Excellence dimension:

- Spend analysis
- Contract management
- Sourcing activities
- Transactional procurement (P2P)
- Supplier Relationship management

Functions, questions and stages
The functions in Strategic Sourcing (PO1) and Supplier Selection (PO2) regarding sourcing are still applying today. All these functions are actually required to start working on e-sourcing at a company. However, an additional function focused on the e-sourcing approach could be added to these existing functions to fully cover the sourcing activities in the model.

Initially, the following four stages were defined for the e-sourcing process. Afterwards, these were split, expanded and improved into several functions.

- **Sourcing process**: -
  - Stage 1: There are no sophisticated tools to guide the sourcing process. Offers might be requested by one or two suppliers over email or phone, or if negotiations and tendering is done, this is happening fully offline.
  - Stage 2: There is a Centre of Excellence working on a few e-tenders per year using an E-Sourcing tool. Most of the sourcing activities are done offline.
  - Stage 3: Clear KPIs on E-Sourcing are set and monitored. A majority of the sourcing activities (>75% of tendered spend) is negotiated online. E-auctions are designed based upon a good methodology and extensively used to acquire additional savings. Sourcing Optimisation is applied to unlock additional saving opportunities in complicated sourcing areas, e.g. realized through advanced scenario modelling.
  - Stage 4: The sourcing activities are mostly done using the e-sourcing tool. The analytics part is mostly manually done offline, instead of directly in the platform. Superusers within the OpCos are trained by the Centre of Excellence but are not able to work independently yet, or at least not capable to do a full project (including multi-phases, and analytics) in the tool.

The interviewee proposed the following functions, questions, and stage definitions to complete the sourcing activities within Procurement Excellence:

- **Tools**: Which tools are used?
  - Stage 1: No tools available. Tendering is done offline.
  - Stage 2: Standard sourcing tools are used without the possibility to analyse data within this tool. Low form of standardisation.
  - Stage 3: E-sourcing is done via templates and standardisation to strongly push for user adoption. Savings are realised through e-auctions and sourcing optimisation tools.
  - Stage 4: Industry (procurement) 4.0 is implemented in daily operations. An example would be Robotic Process Automation (RPA) to create E-Sourcing events or machine learning to identify key value drivers in sourcing activities.
- **Organisational structure**: Where are the E-Sourcing activities located inside the procurement organization?
  - Stage 1: No clear division of responsibilities in e-sourcing activities. Lack of e-sourcing experts to drive initiatives.
  - Stage 2: Several employees are able to work on e-sourcing initiatives independently. An external party is required to train internal users and execute complicated e-sourcing activities.
  - Stage 3: An internal team, from a dedicated CoE, provides e-sourcing training and support, manages the sourcing systems and executes complicated e-sourcing initiatives. A limited number of skilled e-sourcing employees outside of CoE. The business side heavily relies on CoE.
  - Stage 4: Procurement Category Teams and businesses in markets are running their own E-Sourcing activities, backed up by their own system champions (super users). There's an active engagement between these super users and the Centre of Excellence, who for instance share best practices, create sourcing templates that facilitate category/business sourcing strategies, etc.

- **Strategy**: Is there a clear strategy regarding E-Sourcing, and how does this match/relate to the company strategy and underlying category/opco strategies?
  - Stage 1: E-Sourcing is rarely used, if done it's on occasional projects with no clear guidance or strategy towards this.
  - Stage 2: The organisation is using E-Sourcing to capture all tenders in an online platform. However, the quality of the E-Tender set up is poor (as an example: no embedded analysis or questionnaire scoring)
  - Stage 3: E-Sourcing is perceived as a key enabler of additional benefits. The goal is to drive more adoption and to educate the internal user community on how to create best-in-class setups. The organization is starting to measure/monitor the performance and adoption.
  - Stage 4: There's a clear link between the organization's (E-)Sourcing strategy and the organizational goals of the company. The E-Sourcing strategy is broken down on a category level, having specifically tailored templates to automate and optimise tendering activities. Clear KPIs are set and measured to drive the continuous growth of adoption across the entire organization. (Super)Users are trained and educated on this. Continuous development of Roadmap plans & initiatives is discussed to further drive the adoption and performance of (E-)Sourcing activities.

G.4.2 Verification

The interviewee proposed several adjustments and additions to the summary, mainly expanding the E-Sourcing description.

Regarding the model, the interviewee already provided elaborate and detailed descriptions. The wording has been made more consistent but overall content wise nothing changed. When the model was sent for feedback, the interviewee only commented that the earlier described sourcing process and its stages should already be embedded in the other 3 functions. This should make this overall function and stage descriptions unnecessary to include as well. The interviewee is convinced the model is fully covering the sourcing activities.

G.5 Spend & Data Management

Subject: Spend & Data Management
Organisation: *Corporate Group*
Interviewed by: Menno van Dijk
Interview date: April 28^{th}, 2021
Transcribed by: Menno van Dijk
Summarised on: May 13^{th}, 2021
Summary confirmed by the interviewee on:
Interview Type: Video interview using Microsoft Teams

G.5.1 Interview

According to the interviewee, the Spend & Data Management team's responsibilities can be divided into three main topics: (1) Data Gathering, (2) Data Enrichment and (3) Reporting & Analytics.

1. **Data gathering** is focusing on gathering data from the complex IT environment, consisting of many ERP systems and tools that have an impact on the procurement process (Ariba, CSO, Beroe). The data is brought together in a (digital) central environment, the PDW, at a frequency that is dependent on the reporting needs from the business side.

2. **Data enrichment & refinement** is focusing on ensuring that the data is put into the right format: one company, one language, one taxonomy style, and one category tree. The Spend & Data Management team enriches the data through configuration and definition so that there is consistency in the terms and conditions, enabling the possibility to compare the data. Enrichment means the data that is available after the automated process is executed. Refinement is the process of increasing the data quality. Enrichment is mostly applicable to spend data since other forms of data is already enriched by the users.

   A proper example of why enrichment and refinement are required is that without them, the data is stored in more than 10 different languages. Therefore, without these processes, data comparison is not feasible at all. The key reporting dimensions are the category tree, region, supplier enrichment and organisational structure.

3. **Reporting & Analytics** is enabled by the data enrichment step. This includes facilitating: data visualisation, standard dashboards, data mining, data export. The data has become more valuable due to its enrichment. Data analysis should result in a clear and consistent overview, identifying opportunities and acquiring new insights, and better decision-making.

Although the Spend & Data Management team is responsible for the described process, there is also some overlap and collaboration with the e-sourcing team and the PPR team. For example, PPR has the lead in defining how data should be measured while Spend & Data Management ensures the data is actually gathered. The PDW tool, in the end, ensures spend transparency. The interviewee emphasises that the mindset of the PEx team is that they provide the tools to departments and OpCos so they can assess their own performance.

Functions, questions and stages
Unlike most of the topics, spend management was barely embedded in the original model. The company generic part was therefore discussed in interview D.2. The focus of this interview was mainly on the Procurement Excellence side.

Based on the story above, the interviewee proposed to use the three pillars of the Spend & Data management team as functions in the model. The following questions and stage definitions were proposed to complete the Spend & Data management activities within Procurement Excellence:

- **Data gathering**: What is the availability and quality of data that has been provided by the user(s)?
  - Stage 1: Minimal amount of data is provided with only the bare minimum of requirements (unique invoice id & invoice line number, amount of spend in standard format, supplier) in a manual way at an ad hoc frequency.
  - Stage 2: The required and optional fields of data are provided in a manual way at a standard frequency.
  - Stage 3: Automated way of providing the data (required, optional and miscellaneous) at a monthly rate. Validation from the Spend & Data management team is still required thus considered to be a touch process.
  - Stage 4: Automated delivery of high data quality. Data only has to be validated once per year. No-touch process.

Regarding data quality, there has been made a distinction between the following three fields shown below. It is expected that required and optional are at least provided.

- ☐ Required fields: Unique invoice id & invoice line number, amount of spend in a standard format, supplier

- ☐ Optional fields: Local category, cost centre, invoice description, purchase order description, payment term
- ☐ Miscellaneous

The extent to which the data is validated could also be used to define the stages. However, this could become quite complex so the interviewee proposes to currently limit this to the frequency of data validation. Data gathering is also including to what extent the procurement processes are executed as agreed upon. However, this is already included in the other functions such as sourcing activities or supplier selection. There was a short discussion on whether data gathering should be split into the quality of users and quality of systems. However, the interviewee thinks this would increase complexity without contributing to maturity improvement.

- **Data enrichment & refinement**: To what extent is data enrichment and refinement needed?
  - Stage 1: The majority of the spend is L1/L2. A lot of spend is unclassified, the ERP organisational structure is missing and supplier normalisation is no priority.
  - Stage 2: Automated enrichment process with 40% L3+ or higher. The top suppliers are normalised.
  - Stage 3: Automated enrichment process with 70% L3+ or higher. The top 90% of suppliers are normalised.
  - Stage 4: All the key reporting dimensions are available. 95% of the spend data contains category level 3+.

The interviewee emphasises that a high maturity of data gathering naturally results in a high maturity in data enrichment and refinement. It is very important to know that the users are responsible for the data quality and should not blame the tool for being wrong. The dashboards should generate transparency and enable an organisation to tell where you are and what you have to do to increase maturity.

- **Reporting & analytics**: To what extent does an OpCo make use of the reporting and analytics tool (PDW) capabilities?
  - Stage 1: -
  - Stage 2: -
  - Stage 3: -
  - Stage 4: -

The last function could not be discussed in great detail to a time limit. The interviewee described that the stages should be defined based on the use of the main reporting & analytics tool, the extent to which the needs of users is fulfilled, whether opportunities are identified and if they act upon these observations.

In the end, the interviewee's opinion was asked about the implementation of tools in the assessment, whether it should be part of the stage definitions or separate functions. The interviewee acknowledges it is good to take the tools as definitions and separate functions are not necessarily needed. However, the interviewee emphasised that good procurement behaviour is measured by transparency, feedback and process monitoring. This means, people work as has been agreed upon, which ensures consistency. The assessment tool should be able to provide an answer to whether people and departments actually work according to this mentality and how they should proceed by following the stages.

G.5.2 Verification

The interviewee has not been able to spend the time to come up with elaborate feedback. Nonetheless, the interviewee thinks the model is a great reflection of the situation and process.

G.6 Contract Management

Subject: Contract Management
Organisation: *Corporate Group*
Interviewed by: Menno van Dijk
Interview date: April 28^{th}, 2021
Transcribed by: Menno van Dijk
Summarised on: May 16^{th}, 2021
Summary confirmed by the interviewee on: May 17^{th}, 2021
Interview Type: Video interview using Microsoft Teams

G.6.1 Interview

The interviewee describes contract management as the process to:

1. **Repository**: Gather signed and approved contracts or agreements and store those in a repository (SAP Ariba) to manage and maintain them. The contracts are linked to reportable fields which should provide an understanding of the contents of the contract and corresponding spend. Category teams should be able to plan ahead and arrange a new contract with either incumbent or new suppliers (renegotiation, renewal or e-sourcing).
2. **Authorisation and review**: After negotiations have finished, an authorisation process and contract review will start. The contract is reviewed to see who is in charge, determine the budget owner and procurement approver in order to approve and sign the contract.

The interviewee acknowledges that the procurement process starts and ends with contract management. It is even possible that there is a service used without the presence of a contract. Then the first thing to do is to get a contract by fixing the price and minimise the risk.

An interesting and relevant event is the current change of contract systems. At the moment, the authorisation and review process is not standardised but can differ depending on the OpCo or region. There are at least 7 different workflows in use. With the change of contract systems, the workflow should have a minimum of standard approvals for all, in addition to any required variations in the policy of each Region, OpCo, country or site.

Functions, questions and stages
The following functions, questions and stage definitions were proposed to complete Contract Management within Procurement Excellence:

- **Approval flow**: How is the approval flow arranged and managed?
  - Stage 1: There is no clear approval structure. Employees sign contracts while not (fully) authorised. There is only a minimal availability of templates.
  - Stage 2: General approval flow defined by the procurement department. Good templates are approved by the legal department and available at a central location. A lot of communication is needed to approve and sign contracts and not always the right signature ends up in the contract.
  - Stage 3: Best practices but mainly a manual process. Approval flow defined in collaboration with other relevant departments in the organisation considering each category, subcategories or outside procurement. These processes are defined locally, regionally and globally depending on the contract scope.

  - Stage 4: Full definition and clear structure. There are automated templates for different scenarios, defining the spend and threshold depending on the organisation, region and/or category. The process is easy to track through history, approval is easy and approvers are defined and known.

Contract adoption is the next step after negotiation. It ensures the business is actually complying with the agreements that were made.

- **Contract adoption & compliance**: To what extent are the contracts adopted and complied with?
  - Stage 1: New agreements are put in place but there is little to poor communication to stakeholders.
  - Stage 2: Agreements are place and stakeholders are engaged from the beginning of the process until an agreement is approved and signed. No monitoring after the fact.
  - Stage 3: In addition to stakeholder engagement, central tools for easy access are placed for the end-users to know what vendors are available per category and geography.
  - Stage 4: Monitoring and analysis of the usage of each contract are done regularly. Communication with the stakeholders to improve contract usage is also done on a regular basis, especially for contracts with low compliance.
- **Contract analytics**: How are the contracts analysed and how is the data used for improvement?
  - Stage 1: Analytics is mostly focused on expiry dates and planning for next negotiation cycles
  - Stage 2: Procurement looks at new opportunities including previous performance, compliance, spend, discounts etc.
  - Stage 3: Procurement looks at new opportunities including previous performance, compliance, spend, discounts with the help of a tool. End-users can access the contract information and the usage of the tool is analysed to anticipate the compliance of a negotiated contract.
  - Stage 4: Contract spend is connected directly to ERP spend. Negotiated discounts, payment terms and others are monitored and actions are taken. Risk programs are part of the analysis in different aspects like financial, sanctions.

G.6.2 Verification

The interviewee proposed several changes and additions to the summary and model. The summary changes were small and are processed above.

The interviewee believes that what was captured in the model looks correct. However, the additions below are proposed:

- For standardisation, in addition to stage 1: The risk should be emphasised when talking about the possibility of contracts containing signatures of unauthorised employees.
- For contract analytics, in addition to stage 3: Procurement uses other tools to make it easier for the end user to access the procurement contract information and analyses the usage of the tool to anticipate the compliance of a negotiated contract.

G.7 Market Intelligence

Subject: Market Intelligence
Organisation: *Corporate Group*
Interviewed by: Menno van Dijk
Interview date: May 05^{th}, 2021
Transcribed by: Menno van Dijk
Summarised on: May 23^{rd}, 2021
Summary confirmed by the interviewee on: June 01^{st}, 2021
Interview Type: Video interview using Microsoft Teams

G.7.1 Interview

The MI team is part of the PEx team but mainly supports the category teams. MI usually works based on projects by providing the categories with sufficient and insightful information in order for them to make (better) strategic decisions and work on sourcing activities based on the MI data. Initially, categories would make decisions based on their knowledge of current markets. However, MI uses additional market data, insights, research and analysis to provide insights. Therefore, strategic buyers should be able to make better and more factual decisions as opposed to working based on one information source.

MI is divided into 3 groups, each collaborating with 4 categories. The collaboration works in both directions, so either MI approaches a category to discuss an opportunity or a category approaches MI because of a certain need or request. MI has access to additional data sources because of a partnership with a data crunch company. This company provides market information and analysis for several industries and MI is able to use it to their advantage.

Services and offerings
MI is able to provide several types of services and offerings. Usually these are project-based and delivered as either: an email; a MS Excel or PowerPoint file; or PDF report document. The main ones were described by the interviewee as following:

- **Reoccurring reports**: General reports sent on a weekly and monthly basis containing hard data to update the categories and other departments.
- **Deep dive**: An analysis of a (sub)category or commodity group to describe a market; look into the suppliers; show price and demand trends; or define product specifications and corresponding costs. MI defines two types of deep dives:
  - Industry Best Practice: *Competitor comparison by analysing contract models, sourcing models, rebate models; assess supplier performance; conduct case studies in peer best practice.*[1]
  - Market scanning: *Provide information regarding suppliers, products, and services for any given market; benchmark suppliers, study new industry innovations; and provide price analysis.*
- **Cost modelling**: A driver analysis looks beyond the product price and focuses on the TCO structure. This includes services and products such as transport costs and raw material costs to determine the total value of the end-product.
- **Subscriptions**: *A collection of third party suppliers providing commodity and other MI data.*

[1] Descriptions provided in italic were added after the interview based on internal documents and are confirmed to be correct by the interviewee.

- **Platform**: *A free to use, 24/7 available self-service platform, containing providing on-demand procurement intelligence data.*

Functions, questions and stages
MI was already partly described in Environment Scanning (PL3) of the model. Therefore, it was shown to the interviewee to check its relevancy and possible shortcomings.

☐ Process: This function seems to be still relevant and applicable to the MI team. However, it is only limited to a supply market analysis. The interviewee thinks it could and maybe should also include the description of the different services and offerings.

☐ Resources: This function is relevant but does not touch upon possible collaborations with third parties to crunch data, gather information and analyse markets.

☐ Cross-functional integration: This function seems to be still relevant and applicable to the MI team.

The interviewee thinks it is key that the entire organisation is understanding what services and offerings MI can provide. The next step is the process behind those offerings. People should be aware of MI's deliverables and the corresponding steps to take and use the services/offerings. Otherwise, opportunities are unnecessarily wasted.

Since the environment scanning functions are very generic, the following functions, questions and stage definitions were proposed to complete Market Intelligence within Procurement Excellence. It was proposed to include the adoption of MI's data and the awareness and usage of services and offerings. A side note from the interviewee: it could be that some teams do not need all the offerings. Therefore, a team is not necessarily below stage 4 when only partially using MI's offerings.

- **Adoption MI data**: To what extent is the data provided by MI, optimally used?
  - Stage 1: Reports are not used because not useful.
  - Stage 2: Reports are not used while useful.
  - Stage 3: Partial adoption.
  - Stage 4: Integrated in daily process to create value.
- **Offerings and communication**: To what extent is the Opco aware of the MI possibilities and to what extent are the offerings used?
  - Stage 1: Offerings are not known to the targeted audience. However, the team is completely depending on the MI team for data.
  - Stage 2: Offerings are known, but not used.
  - Stage 3: Offerings are known, accepted, and used on a regular basis.
  - Stage 4: Offerings are well-known, accepted by cross-functional teams, and are used according to specific needs. There is someone within the team that can provide data and collaborate with MI to come up with better results. Regular feedback between the parties to enhance communication and collaboration.

G.7.2 Verification

The interviewee only proposed changes for the model. The descriptions that have been added based on internal documents were confirmed by the interviewee. The proposed changes for the model are shown below.

- For the order of the functions, "Communication and collaboration" should be before "Adoption MI data". Possibly the functions can be merged due to large overlap.
- Market analytics
  - Stage 1 had a spelling error in the description and should be fixed. "The business has to is limited to their own resources". The "has to" should be removed.
  - Stage 2 should include that "Information is mostly generic and not specifically fitting the needs of the region".
  - Stage 3 should change the phrase "The central team provides only generic reports" to "The central team provides generic reports with the opportunity to link to business needs with additional analysis".
  - Stage 4 should mention that "There is close collaboration between the data requester (business), central team and third-party market data suppliers". This replaces the first sentence: "The central team collaborates with a third-party to gather and analyse data.". "specific offerings" could be specific and customised, and "portal" could be portal and dynamic platform. These additions are mainly to make the description a bit more generic. The interviewee thinks stage 4 is the description a company should strive for. However, it is specifically tailored to the *Corporate Group* considering the names of the offerings. This may be different for other companies.
- Communication and collaboration
  - The question should not contain usage since this is more related to adoption of MI data.
  - Stage 2 uses the sentence "The main source of data is still the interaction with existing suppliers." This is unclear and should be rephrased.
  - Stage 3 should include "The outcome is often not implemented in day-to day business but treated as a one-off".
- Adoption MI data
  - The stages of Adoption MI data should not be limited to reoccurring reports but just mention reports or offerings.
  - If this function is not going to be merged with communication and collaboration, move the stage part about "improvement to increase the usefulness of the offerings." from Communication and collaboration to Adoption MI data.

G.8 Transactional Procurement

Subject: Transactional procurement (P2P)
Organisation: *Corporate Group*
Interviewed by: Menno van Dijk
Interview date: April 30^{th}, 2021
Transcribed by: Menno van Dijk
Summarised on: May 19^{th}, 2021
Summary confirmed by the interviewee on: May 26^{th}, 2021
Interview Type: Video interview using Microsoft Teams

G.8.1 Interview

Purchase to Pay (P2P) is the process starting from the identification of a need (service or product) and ending when the invoice is paid and the corresponding data is available (PDW) for analysis.

This includes everything in between such as the order process via paper, telephone or a system; the execution and delivery of the product or service; and receiving the order. It is important that in the end the invoice data is used to maximise the opportunity for future tenders.

e-P2P
Recently e-P2P program with a supplier portal has been kicked-off. A few operating companies have been selected for the pilot of this project. As preparation, it is important to determine how the current processes are designed and performing, and where should they be headed towards. Additionally, IT and system changes had to be taken into account. It is important that each company, region and category follows up by delivering the right information to implement e-P2P. Since the system is released in waves, each wave will be a learning opportunity to improve the implementation for the next wave. This should not only apply to e-P2P but also to other roll-outs.

The impact of e-P2P will be most significant on an operational level and the replacement of, or integration with, existing systems. At this moment, there is no global or standardised process to do purchasing for indirect goods and services. E-P2P should provide a framework that only allows people to purchase services/products if they are allowed to. Also, it should also be easier for individuals to order goods and services because the tool brings an "Amazon-like-shopping-experience". It is anticipated that the e-P2P system creates a clear structure and provides better insights. Therefore, both the process of contract management as well as accounts payable should improve and become more efficient. However, people are currently either not working according to a clear structure or there are major differences in the purchasing approach. Although the system will facilitate a certain way of working, people still should be trained and made aware of the correct approach.

Functions, questions and stages
The following functions, questions and stage definitions were proposed to complete Supplier Relationship Management within Procurement Excellence:

- **As-is situation**: To what extent is the OpCo in control of the P2P process and how are these steps automated?
  - Stage 1: End to end p2p process is fully manual.
  - Stage 2: Partial automation, only invoice processing.
  - Stage 3: The majority of the p2p process is automated, including a possible OCR tool.
  - Stage 4: Touchless, fully automated, possible discrepancy invoice handling. (The latter is a manual step)
- **Quality and Availability of P2P Data**: What is the availability of P2P Data and the corresponding quality?
  - Stage 1: Almost no availability and overview in the data. Unreliable quality, no trust in the data.
  - Stage 2: Limited data available, quality can be questioned. Partial automation in place, mainly invoice processing, no overview in compliance.
  - Stage 3: Most of the data available via the automation. Quality is more than sufficient/accurate to do data analysis but still levels of incompleteness.
  - Stage 4: Data is automatically processed and used in the tool. Data quality is sufficient, available, reliable and thus reports can be retrieved from the system and be trusted blindly.

- **Use of P2P Metrics and Reporting**: To what extent do you use metrics/KPIs to manage & challenge the transactional process?
  - Stage 1: No formal p2p metrics and reporting currently in place.
  - Stage 2: Some formal p2p metrics and reporting in place. But still learning how to utilise.
  - Stage 3: P2P metrics and reporting in place to manage the process. Different baselines and formats.
  - Stage 4: P2P metrics and reporting utilised, following a baseline, to manage the process to include goals that will promote improvement. Company standardised formats are used.

G.8.2 Verification

The interviewee proposed a few small changes for the interview summary and confirmed the model looks good. The summary changes have been applied above. The proposed changes for the model are shown below.

- For As-is situation, in addition to stage 4: Mention that possible discrepancy invoice handling is a manual step.
- Use of P2P Metrics and Reporting: Change question to both "manage & challenge the transactional process".

G.9 Supplier Relationship Management

Subject: Supplier Relationship Management
Organisation: *Corporate Group*
Interviewed by: Menno van Dijk
Interview date: April 29^{th}, 2021
Transcribed by: Menno van Dijk
Summarised on: May 18^{th}, 2021
Summary confirmed by the interviewee on: July 12^{th}, 2021
Interview Type: Video interview using Microsoft Teams

G.9.1 Interview

Supplier relationship management enables an organisation to manage and improve the end-to-end process and third-party supplier base in order to strengthen relationships and create value. SRM can be divided into the following four pillars:

1. **Risk management**: The goal is to determine the (potential) supplier risks and subsequently, determine the actions to take in order to reduce the impact of those identified risks. A great example is the KYS program where suppliers are invited to track their financial risk and adverse media and ensure compliance.
2. **Contract management**: This involves a contract repository plus the assurance purchasing is compliant with your contracts. After the negotiation or tender process, agreements are put in writing. These contracts should be made visible to do the purchasing according to the agreements. The focus is therefore on risk hedging and compliance.
3. **Supplier optimisation**: Creating an overview/database of the supplier base and subsequently this database should be optimised. This includes several initiatives in collaboration with the Category and PEx teams. A proper example is the rationalisation of the supplier base through tail spend initiatives and implementation of the e-P2P program. Additionally, a portal is developed and implemented to acquire a golden record of suppliers.

Currently, there are a lot of duplicates due to parent companies and slightly different names (including dots or spaces). In order to solve this, the ideal situation would be to optimise input and output by harmonising and cleansing the supplier base and thus deleting vendors if they are not used anymore. This could enhance compliance and provide the opportunity to easily analyse suppliers, identify risks and create reports.

4. **Supplier relationship management**: The process to gain a competitive advantage and increase the bottom-line performance through supplier segmentation, supplier performance reporting and analytics, and value creation through strategic partnerships.

Contract management
Although contract management is part of the SRM team, it was a separate subject of discussion in another interview. The interviewee had a few additions/remarks to the topic.

The interviewee proposed to rename the function of approval flow to standardisation since the stages actually revolve around standardisation and automation. The approval and authorisation flow are only a part of this. The end goal would be to have a no-touch process through good standardisation and automation. The processes should be clear and a sophisticated tool should enable this.

Procurement process
The visualisation of the procurement process was shown to explain how the additional dimension of the model has been designed. The interviewee emphasised although the model is correctly showing the different team, functions and corresponding tools, it lacks to touch upon the full scope of SRM.

Considering this visualisation, SRM can be broken down into two elements. On the one hand, the company's perspective on determining how to optimise the relationships with suppliers. On the other hand, from the suppliers' perspective, what steps do they have to take in collaboration with the company and how can these be simplified and optimised. These two are elements are not embedded in the procurement process visualisation.

The interviewee emphasises the systems and tools should not be the starting point of process improvement. The starting point should be prioritising the goals of the company/department/team and subsequently determining how to realise these goals. From the SRM perspective, it is all about identifying, analysing and optimising the supplier relationships and gaining a competitive advantage. This also includes sustainability initiatives and innovative solutions, while this is usually difficult for major organisations. Therefore, you need partnerships with small and disruptive companies.

Functions, questions and stages
The interviewee reviewed the existing model regarding SRM functions (Process Organisation) and came to the conclusion the following functions are missing: performance tracking is missing, risk management and segmentation & value creation. The following functions, questions and stage definitions were proposed to complete Supplier Relationship Management within Procurement Excellence:

- **Supplier performance**: To what extent is supplier performance measured and how is this anticipated?
  - Stage 1: Supplier performance reviews are incidental and limited.
  - Stage 2: Supplier performance reviews are incidental but unilateral.
  - Stage 3: consistent assessment of supplier performance, including the company's performance. Data is properly gathered and used but the company could be more responsive.

  - Stage 4: consistent assessment of supplier performance, including the company's performance. Data is properly gathered and used through the use of proper systems (PDW, eP2P) to create scorecards. The company is responsive and actually acts based on findings.

- **Supplier risk**: How are supplier risks analysed and managed?
  - Stage 1: Only a small number of suppliers is assessed for risks, reaching a minimum amount of spend coverage.
  - Stage 2: 80% or more of the spend is covered in the risk assessment.
  - Stage 3: Mitigation actions are in place
  - Stage 4: Mitigation actions are in place and risk-based approach, thus focusing on the controversy and particular risks at small suppliers.
- **Segmentation & value creation**: To what extent are suppliers segmented and how are the relationships defined?
  - Stage 1: Supplier segmentation is done in bits and pieces but not in a structural way (category level).
  - Stage 2: Supplier base is segmented and activities are focused and executed.
  - Stage 3: Supplier base is segmented and partnerships and collaborations are established with incumbent suppliers to create value in areas such as innovation and sustainability.
  - Stage 4: Supplier base is segmented and collaborations are established outside known supplier base through joint ventures and cross-functional partnerships. Value is created with the help of a platform in areas such as innovation and sustainability to have a bottom-line impact.

G.9.2 Verification

The interviewee confirmed the correctness of the contents of the summary and model, but did not provide any feedback.

Appendix H: Interview Groups and Codes

Table H.1: Interview groups and codes per maturity domain (blue is present in interview, red is present in model)

Group	Code	Indirect Spend Management		Spend & Data Management		Contract Management		Market Intelligence		Sourcing Activities		Transactional Procurement		Supplier Relationship Management		Interview	Model
Communication	Awareness															3	3
Communication	Collaboration															4	3
Communication	Compliance															3	3
Communication	Engagement															2	2
Communication	KPI/metrics															2	2
Communication	Resources															2	2
Communication	Training															2	2
Communication	User needs															2	2
Data	Analytics															6	5
Data	Availability															3	3
Data	Frequency															4	4
Data	Overview															4	4
Data	Quality															2	4
Data	Reliability															2	2
Data	Validation															1	3
Digitalisation	Adoption															4	4
Digitalisation	Automation															4	4
Digitalisation	Centralisation															4	3
Digitalisation	E-tools															7	7
Digitalisation	Standardisation															5	5
Digitalisation	Supplier base															2	2
Performance	Opportunity															5	3
Performance	Reporting															4	4
Performance	Responsibility															3	2
Performance	Review															2	1
Performance	Risk															2	3
Performance	Savings															1	3
Performance	Value creation															3	2
	Total	5	9	17	15	15	14	12	12	15	13	15	13	9	10	88	87

Appendix I: Extended Maturity Profile Instrument

Table I.1: Extended maturity model based on H. Schiele (2007)

Function	Questions for Analysis	Current level	Stage 1 (0% - 25%)	Stage 2 (26% - 50%)	Stage 3 (51% - 75%)	Stage 4 (76% - 100%)
1. Procurement Planning (PL)						
Demand Planning (PL1)						
Process	**To what degree is purchasing involved in the project/product planning? Is this a documented and revolving process?**		Product or project planning is sporadically known to purchasing.	Dedicated purchasing personnel are informed about product or project planning. Purchasing has access to demand planning systems.	Purchasing is integrated into product and project planning and utilises existing demand planning systems. Purchasing inclusion points are defined in the process documentation.	Early involvement of purchasing in product and project planning is always ensured. Planning results are an integrative component of the purchasing strategy.
Assessment of demand	**Where are requirements and demands derived from? How is the process described?**		Demands are partly derived from sales or order income prognosis/forecasts.	Demands are derived from sales or order income prognosis/forecasts and planned for significant commodity areas.	Demands are derived systematically and in structured fashion from sales or order income prognosis/forecasts. Procurement market facts are remedially considered.	Pro-active demand control on the basis of procurement market facts and product life-cycles (Product Lifecycle Management).
Pooling Planning (PL2)						
Planning	**Are commodities analysed for group-wide pooling potential? Does this regularly happen to all commodities?**		Occasional analysis of selected commodities.	All commodities are analysed based on commodity code data.	Complete purchasing volume is permanently analysed in regard to pooling opportunities. Results are documented.	Future demands are analysed regularly of their pooling opportunities Cross-functional partners are involved.
Mandates	**How are negotiation mandates and responsibilities defined? Are there group-wide procedures established?**		Regulation of negotiation mandates and responsibilities is planned.	Negotiation mandates and responsibilities are partially regulated for single commodities.	Negotiation mandates and responsibilities are regulated. Process applied for all commodities.	Negotiation mandates are delegated and responsibilities are clearly defined on a global basis. Mandates are actively applied.
IT Support	**Which IT tools support you when analysing and managing poolable demand?**		Insufficient application of IT tools for pooling (e.g. Excel or similar IT-tools).	Application for a business unit wide IT tool for pooling.	Application of a uniform IT-tool for group-wide pooling.	Application of an integrative intranet-based IT tool for corporate-pooling? Intranet based preferred parts and preferred suppliers database used cross-functionally.
Environment Scanning (PL3)						
Process	**How is the process of a supply market analysis described and documented?**		Process is described unsatisfying.	Process is partially described.	Process is documented and applied.	Processes subject to regular reviews. Cross-functional acceptance and commitment.
Resources	**Is sufficient personnel allocated to market analysis?**		Provision of personnel capacity of supply market analysis is limited available.	Sufficient personnel for market analysis is available. Responsibilities and commodity groups are defined.	Own capacities for market analysis are derived out of the planning process and are available for market scan activities.	Capacities for market analysis (own and where necessary bought) are available. Cross-functional partners can be involved if required.
Cross-functional integration	**How are partner functions involved in drawing conclusions out of the analysis results?**		Results out of the supply market analysis remains mostly at purchasing.	Less active exchange with other process partners (e.g. Engineering, Sales).	Regular information exchange with partners (e.g. Engineering, Sales).	Exchange of market analysis results occur continuously and protected against non-authorised use.
Innovation Planning (PL4)						
Technology identification	**How do you keep track of technology trends? Is there a formal process of technology monitoring?**		Purchasing reactively follows procedures of process partners (e.g. Engineering, Sales).	Purchasing present remedially information about technology trends to their process partners. Technology monitoring is part of purchaser's responsibilities.	Purchasing acts pro-actively following established processes.	Purchasing support systematically product or technology development. Information about technology trends will be used through cross-functional partners.
Technology roadmaps	**Do purchasers know the technology roadmap of your company and your suppliers? Is there a methodology of correlating your technology roadmaps with those of your suppliers?**		Own product and technology roadmaps partially known.	Own product and technology roadmaps are known, those of strategic suppliers are partially known. Responsibilities for roadmap-analysis defined.	Process of matching own product and technology roadmaps with the roadmaps of significant suppliers.	Implementation of harmonised product and technology roadmaps with selected suppliers, cross-functionally agreed.
2. Organisational Structure of Purchasing (OS)						
Structure & Mandates (OS1)						
Organisational structure	**Is a purchasing organisation established? Are responsibilities defined?**		Purchasing responsible people are named. Purchasing organisation is insufficiently established.	Purchasing organisation is formally in place.	Purchasing organisation is established and is in charge of all procurement activities. Procurement policy is described and communicated via internal circular latter as mandatory.	Purchasing organisation is continuously further developed based on business strategy, benchmarks, interviews or process reviews.
Mandate	**Is purchasing responsible for all procured goods and services? Do you have regulations for sanction in case of non-compliance?**		Many commodities are not managed in responsibility of purchasing.	Purchasing initiates programs and measures for mandating procurement fields. Penetration >50%.	Purchasing has the mandates for complete purchasing volume defined mandatorily and communicated. Penetration >80%.	Regulations for sanctions in case of non-compliance are introduced. Penetration ca. 100%.

Cross-functional integration	**Are interfaces towards partner functions defined? Are they cross-functionally agreed and responsibilities defined?**		Interfaces of purchasing are known and tasks are partially described.	Interfaces are cross-functionally agreed for isolated function. Respective tasks and responsibilities at the partner functions are known.	Tasks and responsibilities are coordinated with all interfaces according to company wide defined processes and are described in a guideline.	Purchasing drives continuous improvement and the definition of interfaces and guideline.
Integration into group	**How is purchasing integrated in the purchasing network of the group?**		Purchasing acts locally without exchange with other purchasing departments.	Purchasing remedially exchanges information with other purchasing departments.	Purchasing is an active part of the group-wide procurement network.	Purchasing is an integrative part of the worldwide procurement network of the group.
Spend Management (OS2)						
Understanding and awareness	**How are direct and indirect procurement defined and perceived in the company?**		There is no clear internal definition for indirect spend and barely anyone is aware of the difference to direct spend.	There is a company definition with many exceptions and there is still some debate and disagreement among the responsible people.	There is a clear definition for indirect spend with only several exceptions and most of the responsible people are aware.	There is a clear definition, barely any exceptions and the vast majority of the people is aware and understands the importance.
Communication and responsibility	**How is the communication and interaction between the different categories and the Region/OpCo?**		Barely any to no interaction between the categories and Region/OpCo. There is no indirect sourcing manager to facilitate communication between the different parties involved.	There is only interaction between several categories and the Region/OpCo. The need is identified to appoint someone as indirect sourcing manager.	Significant interaction between the different Category Managers and the Region/OpCo. Although there is a responsible manager for indirect sourcing, there is no clear interface between the involved parties.	There is an indirect sourcing manager committed to coordinating the interface between the indirect purchasing departments of the Region/OpCo and Category Managers.
	How is the responsibility divided for the Region/OpCo regarding indirect procurement?		There is no person assigned as the NPR buyer (non-product related). NPR purchases are done by multiple unidentified people within the Region/OpCo.	NPR purchases are done by multiple identified persons within the Region/OpCo.	The appropriate person is assigned as the NPR buyer but certain activities are still carried out by someone else. Category Managers start to recognise their responsibility to act and take initiative.	NPR purchasing is done by the appropriate person and the management has an overview of those people. All the Category Managers feel the responsibility to act when deemed necessary.
Purchasing process	**How are indirect goods and services bought?**		There is no difference made between buying direct or indirect goods/services. Purchases are done mostly in an analogue manner.	There is a difference made between buying direct or indirect good/services. Purchases are partly done in an analogue manner and partly digitally.	There is a clear difference between buying direct or indirect good/services. Purchases are done mostly in a digital manner.	Purchases are always done in a digital manner if possible. The majority is bought through the use of an e-catalogue.
Approach	**How is the approach for spend management and which tools are used?**		There is no clear and unambiguous approach to manage the spend. Multiple tools are used, the origin of the data is not always known, it is presented inconsistently and details are missing.	Spend management is done by using a main tool, but additional tools are still needed. The origin of the data is known, but it is presented inconsistently and details are missing.	Spend management is done by using a main tool, but requires support from an additional tool. The data is mostly coming from one source and is presented consistently covering most of the details.	There is a clear and unambiguous approach to manage the spend. The majority of activities in spend management can be covered with only one tool. The data is coming from one source and presented in a standard format.
Strategic Integration (OS3)						
Board meetings	**Does the purchasing director take part in board meetings?**		Purchasing director participates occasionally in the board meetings.	Purchasing director is permanent member of the board committee.	Purchasing director is permanent member of the executive committee of the business unit.	Purchasing director directly reports to business unit Executive Management (CEO/CFO).
Make-or-buy decisions	**Is purchasing involved in all make-or-buy decisions? Does purchasing take part at core competency definition and strategic decisions?**		Purchasing is informed about procurement related aspects in make-or-buy projects. Core competencies of the business units are defined, but without purchasing involvement.	Procurement is involved in major make-or-buy decisions. Core competencies of the business unit are detailed documented and published.	Purchasing is involved in all make-or-buy decision and influences the definition of core competencies, as part of strategy definition.	Purchasing is an integrative part of the make-or-buy decisions. Purchasing tasks are documented and cross-functionally accepted. Potentials for optimisation of the depth of own value added are indicated along the product life-cycle.
3. Process Organisation (PO)						
Strategic Sourcing (PO1)						
Sourcing Strategy	**How is the sourcing strategy determined? Is it documented and known to your partner functions?**		Defining of a sourcing strategy is in progress.	Sourcing strategy is documented and applied for all major material groups.	Sourcing strategy is derived out of corporate strategy, cross-functionally agreed, documented and applied.	Sourcing strategy is defined as a roadmap, regularly updated, adjusted to corporate strategy and tied into target agreements.
Process supplier selection	**Is supplier selection carried out systematically and according to requirements profile and selection criteria? Is the selection process well defined, logical and documented?**		Supplier selection process is not or only partially described.	Selection process is defined and cross-functionally applied. Supplier selection occurs systematically based on requirement profiles and selection criteria.	Selection process is completely applied. Supplier decisions are traceable documented (e.g. quotation comparison sheet).	Supplier selection is based on complete application of insights and decisions throughout the company (e.g. pooling organisation, supplier evaluation results, etc.). Selection process is continuously adjusted to latest requirements of the business unit.
Responsibility	**Who is responsible for supplier selection?**		Purchasing is not or only partially involved in supplier selection.	Purchasing supports supplier decisions.	Purchasing is process owner for the supplier selection process.	Cross-functional decision-making committee (e.g. Sourcing Committee) is in charge of the supplier selection process.

Supplier Selection (PO2)						
Process documentation	**Is the sourcing process documented?**		Sourcing process is documented insufficiently.	Approach for sourcing has been defined internally in purchasing.	Compliance with the documented and cross-functionally accepted sourcing process.	The organisation is aligned to support the sourcing process.
Negotiation	**If preparing a negotiation, do you follow a uniform and systematic approach? Are decision criteria, tactics, and targets agreed cross-functionally?**		Less negotiator preparation.	Systematically preparation approach. Negotiation targets are explicitly defined and documented. Customer requirements are considered the negotiation strategy.	Cost structures of suppliers are analysed. Procurement relevant consequences from possible negotiation results are analysed and evaluated. Negotiation targets are methodically deducted and explicitly defined. Process is described.	Future influencing factors on cost structure of suppliers are considered (cost reduction potentials, market prices, funding, etc.). In the case of awarding high-volume contracts, structured negotiation strategies are applied. Decision-making criteria are accepted cross-functionally.
Contract management	**Do you have a Contract Management function in your organisation and what are its activities?**		Tasks are hardly described and are covered within other responsibilities. No application of standardised contracts.	Tasks are isolated described contact partners are known. Application of company wide and existing standards.	Task is pursued by responsible persons and shows first results. Application of standards under group wide adoption and owns structure (e.g. contract configurator).	Function is an established interface between cross-functional partners and purchasing. Functions significantly drives and determines contract management issues. Group wide standards are communicated and are valid.
Supplier Evaluation (PO3)						
Process	**Is there a systematic procedure for Supplier Evaluation in place?**		There is no supplier evaluation systematics in place.	Less than 60% of the purchase volume is evaluated according to an applied supplier evaluation systematics.	60 - 80% of the purchase volume is evaluated according to an applied, cross-functional supplier evaluation systematics.	More than 80% of the purchase volume is evaluated according to an applied cross-functional supplier evaluation systematics.
Communication with suppliers	**Are evaluation results communicated to suppliers? On a regular basis?**		Evaluation results are sporadically communicated to suppliers (e.g. during price negotiations).	Evaluated suppliers are promptly informed about the evaluation results. Results are internally recorded (e.g. central database).	Evaluation results are discussed with selected suppliers in a cross-functional team.	Evaluation results are discussed with selected suppliers under involvement of the management.
Responsibility	**Do you have a Supplier Management function in your organisation?**		Supplier Management function is hardly existing.	Function is documented and implemented.	Function is implemented as described and is actively managing the Supplier Management processes.	Function is an established interface between cross-functional partners and purchasing, drives application of agreed supplier strategies and reports relevant results (e.g. cost reduction, contribution to business).
Supplier Development (PO4)						
Process	**Is there a systematic procedure for Supplier Evaluation in place? Is the process described and communicated within the company?**		Supplier development measures are defined individually.	A planning process is existing for all substantial suppliers.	The supplier development process is defined. Supplier development plans are derived from the supplier evaluations and are implemented.	Development process is implemented and regularly updated. Development plans are harmonised across the organisation and derived from the supplier development strategy. Communication of all results is ensured.
Optimisation	**Do you visit the sites of your supplier on a regular basis? Do you perform trainings and workshops with your suppliers?**		Selective visits at suppliers.	Periodical realisation of trainings and workshops at the supplier.	On demand internal/external resources are available to support projects, training and implementation.	Professional consulting project and trainings take place. Resources for consulting are permanently provided for respective project. Joint continuous measurement of development success with suppliers.
Phase-out	**How would you describe the supplier phase out process? Who decides about phase out?**		Suppliers will be phased out based on subjective criteria.	Responsibilities for phase-out decisions are defined.	Phase-out strategy exists. Process with defined criteria is described.	Consequent application of phase out strategy, cross-functionally agreed.
Purchasing Early Involvement In Development process (PO5)						
Process	**Does the process follow a documented path? Are tasks and responsibilities well defined within the overall process?**		There is no early purchasing involvement process existing. Purchasing is not considered within the product development process.	Processes of early procurement involvement are described, responsibilities defined. Involvement and tasks of purchasing are documented within the product development process.	Processes of early procurement involvement are synchronised with the product development process. Responsibilities are clearly documented. Process targets are defined and responsible persons are measured at these targets.	Product development processes are compared and continuously improved by benchmarks of business units/other companies.
Cross-functional integration	**How is purchasing involved in the product development process?**		Purchasing is sometimes invited to team meetings by the engineering team.	Purchasing is an integrative part of the cross-functional engineering team during the design phase.	Purchasing is an integrative part of the cross-functional engineering team during the concept phase.	Purchasing is actively involved in the idea phase (e.g. concept workshops) and supports product- and program planning in respect to feasibility of product ideas.

Standardisation	**Does purchasing pursue consequently measures to reduce complexity of products, processes and sourcing procedures?**		Standardisation is not consequently considered within the product/project development process.	Purchasing influences consequent reduction of unnecessary complexity of components, processes and sourcing structures.	Defined standards (e.g. modules, component catalogues), suppliers per product/service resp. technologies are applied.	Basic concepts of standardisation (e.g. product platforms, modules) are defined cross-functionally together with purchasing.
Material/functional release	**Has purchasing any impact on material/functional release?**		Purchasing remedially determined material/functional release.	Material-/functional release occurs cross-functionally by engineering, quality and purchasing.	Purchasing is an integral part of material/functional release process and driver for 2nd Source.	Purchasing monitors and improves materials/functional release procedure based on jointly agreed targets together with partners.
Early Supplier Involvement Process (PO6)						
Early supplier involvement	**To what extent are suppliers incorporated into the phases of product development?**		Less involvement of suppliers.	Suppliers provide regular focused and comprehensible input. Preliminary value added stages are explicitly considered.	Suppliers are systematically involved following a defined process. Development capacity of the supplier (resident engineer) is used on demand.	Suppliers are integrated on the basis of total cost of ownership criteria. Simultaneous engineering/joint project management with the supplier occurs on demand.
Technology roadmaps	**For which suppliers do you have their technology roadmaps accessible?**		Technology- and market strategies of the own product and service portfolio are known.	Technology- and market strategies of the suppliers' product and service portfolio are known.	Technology and market strategies of the suppliers' product and service portfolio are known and occasionally adapted to own ones.	Technology and market strategies of the suppliers' product and service portfolio are mutually adapted in substantial commodity groups.
Process Involvement With Other Functions (PO7)						
Involvement marketing	**Is purchasing acquainted with marketing strategies and relevant markets?** **Is purchasing familiar with key customers?**		Marketing strategies are known in purchasing. Integration depends on single persons.	Existing and future marketing strategies are known in purchasing.	Purchasing influences marketing strategies or sales prognosis by provision of procurement market know how following a regular process.	Purchasing is integrative part in the development of marketing strategies and sales prognosis.
Involvement quality	**Is quality management included in the supplier selection process?** **Do purchasing and quality department form one face to suppliers?**		Integration of purchasing depends on single persons. Integration occurs incidentally, criteria for integration are not existing. Quality management is subject to quality department.	Purchasing supports the quality department in quality related issues resp. supplier issues (e.g. claim and extra expenses cases). Interfaces established.	Integration and tasks of purchasing into the quality management system. Responsibilities and tasks of purchasing are clearly described. Resources with respective quality competence are existing in purchasing.	Quality engineering function is established in purchasing. Suppliers are integrated into the quality management system and carries out quality improvement programs together with the quality department.
Involvement logistics and production	**How and to what extent is the procurement logistics/material handling process defined?**		Inbound logistics processes are unstructured and not or only partially documented.	Logistics processes are structured, documented and implemented. Tasks of operative procurement are described within het logistics processes. Escalation model (e.g. troubleshooting for missing parts) is described.	Processes are regularly reviewed and improved. Purchasing is involved with all product ramp-ups and phase-outs as well as into the change management procedure.	Logistic processes describe the applied sourcing models. Purchasing drives activities along the value chain and is integrated at each phase.
Logistics targets	**Are there and if so, what are the joint targets between purchasing and material handling/logistics?**		Logistics targets are known to purchasing and sometimes part of supplier negotiations.	Logistics targets are partially known to purchasing and are considered in supplier negotiations.	In the regular process, logistics agreements are concluded together with logistics department at substantial suppliers.	Logistics targets are defined jointly with logistics, continuously updated and implemented.
Involvement operative procurement	**Are agreements of strategic purchasing known by operative procurement?** **Is a consisted information exchange ensured between both departments?**		Agreements of strategic purchasing are not known to operative procurement and vice versa.	Agreements of the strategic purchasing are known to operative procurement. Information exchange between the departments is ensured.	Strategic and operative purchasing systematically exchange important subjects about suppliers (approach, agreements, problems). Agreements with suppliers are known to operative purchasing and are implemented.	Strategic agreements with the supplier are fully implemented by operative procurement and are complied. Topics of operative procurement are agreed with suppliers by strategic purchasing.
Involvement risk management	**Is risk management an integral part of the purchasing process?**		Less involvement of purchasing.	Responsibilities within purchasing are clearly described and communicated to the employees.	Involvement and tasks of purchasing at the risk management process are described. Implementation follows widely the process description.	Risk management is an integrative part of the purchasing process. Cross-functional involvement ensured and documented.
4. Human Resources and Leadership in Procurement (HR)						
Job Description and Competencies (HR1)						
Functions	**Are key functions described in a generic way?**		Individual purchasing functions are described in general.	Substantial purchasing functions are standardised described, documented and adapter to firm strategy.	Purchasing functions are described in detail and agreed with cross-functional partners. Descriptions of purchasing functions are standardised at all sites.	Developments/ tendencies of job profiles are observed and forwarded for review on group level.
Technical competence	**Is there technical competence available in purchasing?** **Are designated competences available (e.g. Advanced Sourcing Engineer)?**		Partial existence of technical competence, further development is planned.	Technical competence in purchasing is existing for all substantial commodity areas.	Technical competence in purchasing is existing for all substantial commodity areas. Project management competence in purchasing is sufficiently developed for efficient collaboration with project teams.	Competencies for all substantial commodity areas are existing and will be continuously developed, remedial and temporary introduction of special knowledge (e.g. consultants).

Personnel Selection and integration (HR2)						
Selection	**On which methods/ systematics is the recruiting process based on? Is recruiting executed in a systematic and structured manner?**		Recruiting is mainly based on experience.	Recruiting is based on generally described purchasing job profiles.	Recruiting occurs methodically, structured and is aligned to the vacant purchasing function.	Recruiting occurs on the basis of a competence mode. Structured interviews on the basis of standardised interview questionnaires with systematic and cross-functional analysis of results.
Integration	**Are training plans available? To what extent?**		Training plans are under development.	Training plans exist for few functions. Supervisor/Coach is defined.	Systematic integration based on training plans with defined checkpoints. Availability for substantial purchasing functions.	Cross-functional training plans are enhanced by target agreements. Feedback dialogue after completion of integration period.
Performance Appraisal & Career development (HR3)						
Target agreements	**Are targets defined on employee level? To what extent? Do targets contain qualitative and quantitative elements?**		Target agreements on the non-managerial level is not existing.	Occasional finalisation of target agreements on the non-managerial level. Target agreements include qualitative and quantitative targets.	Target agreements finalised with the complete staff. Continuous support and review.	Target agreements are coordinated and defined with cross-functional partners if necessary, reviewed during the fiscal year.
Career development	**Are there regular conversations in respect of employee development? Is there a structured process to identify potential candidates?**		There are no conversation in respect of employee development.	Unregular exchange with potential candidates.	Annual structured review of potential candidates and initiation of development measures.	Group/Regional wide review of potential candidates and introduction to the company procurement network.
Feedback process	**Is there a formal and regular procedure of monitoring and feedback established?**		There is no feedback procedure in place.	Remedial request of single feedback from employees.	Application of the available human resource instruments and remedial feedback of cross-functional partners.	Annual employee dialogue of employees with purchasing department manager. Cross-functional, regular feedback with process partners (e.g. workshops, customer satisfaction surveys etc.). Bottom-up feedback established.
5. Purchasing Controlling (CO)						
Controlling Systems (CO1)						
Target result definition	**Are the targets for the purchasing function derived from the business plan of the group? Is purchasing involved in defining its targets together with executive management?**		Purchasing targets are derived isolated out of business planning targets.	Purchasing targets are derived from the business planning targets under involvement of purchasing. Targets are not cross-functionally agreed.	Purchasing is comprehensively involved in the target setting of the business unit planning process. Purchasing targets are partially cross-functional accepted based on rolling forecasts.	Purchasing is significantly involved in the target setting of the business unit. Input out of procurement markets are considered in the planning process. Impact of purchasing targets in business results are integrated in the budget and rolling forecast.
Target break-down	**How are targets broken down? Are they detailed on employee-level?**		There is no structured target breakdown in place.	Single financial results hard performance figures are defined and remedially reviewed.	Substantial financial results and performance figures are defined and are reviewed regularly.	Targets are broken down and structured based on scorecard targets (e.g. processes, finance, customer/market, employee/knowledge/innovation) and reviewed regularly on the basis of rolling forecasts.
Measurement figures	**Are measuring parameters defined?**		Only limited target follow-up based on existing performance figures possible.	Substantial performance figures (e.g. balanced scorecard) are implemented.	Group-wide mandatory performance figures are completed by own ones for particular areas.	Performance figures for all scorecard targets are continuously and cross-functionally defined.
Controlling Process & Structure (CO2)						
Organisational structure	**Is the function of planning and steering available and established? Are the planning and steering tasks of purchasing clearly defined and documented?**		Planning and controlling function for purchasing controlling is not existing.	Planning and controlling function for purchasing controlling is existing.	Planning and controlling tasks of purchasing are described and implemented as an own function with defined processes.	Planning and controlling tasks of purchasing are applied as described and are integrated into the operative controlling processes of the business unit.
Responsibility	**Are roles and responsibilities clear and described?**		Tasks and responsibilities are insufficiently described.	Tasks and responsibilities are sufficiently described.	Tasks and responsibilities are described according to requirement profiles and are applied.	Tasks and responsibilities are included in an superior controlling guideline of the business unit. Implementation mandate for agreed standards in purchasing controlling is established.
Target controlling process	**How are deviations from plan handled?**		Target-/Actual-comparisons are unregularly applied.	Target-/Actual-comparisons are regularly applied. Necessary correction measures initiated partially.	Target-/Actual-comparisons are applied on the basis of rolling forecasts. Correction measures are consequently implemented.	Business results of the identified measures are reviewed and documented.

Measurement controlling process	**Is there a structured procedure for controlling measures/actions/activities? Do you have the degree of implementation logic (or any other, e.g. milestones) in order to track the realisation progress?**		Results relevant measures are hardly tracked.	Measures are tracked regularly.	Measures are regularly tracked by the degree of implementation systematic or similar.	All measures are systematically tracked based on their impact on business results. Supervision of measurement implementation by business unit management.
Controlling Methods & Tools (CO3)						
Commodity codes	**Do you classify your materials to any kind of commodity code (e.g. ecl@ss)?**		Commodity code classification only for selected commodity areas.	Correct and complete commodity code classification for "direct material" is ensured.	Commodity code is defined as a mandatory data field for order release. Continuous revision of wrong commodity code classifications.	Correct and complete commodity code classification is ensured for the total purchase volume.
IT Support	**Are you able to perform spend analysis? On what level of automation?**		Purchasing volume is available only for the local ERP-systems.	Purchasing volume is generated by calculating according to a group-wide accepted method and can be retrieved to a specific purchasing needs.	Regular provision of purchase volume in a central database (e.g. purchasing information system.	Availability of all purchasing volume data in a central database on a monthly basis and active support of standardised supplier number matching process.
6. E-Procurement (EP)						
Spend & Data Management (EP1)						
Data gathering	**What is the availability and quality of data that has been provided by the user(s)?**		Minimal amount of data is provided by the Region/OpCo. The data is only meeting the bare minimum of requirements (unique invoice id & line number, amount of spend in standard format, supplier) in a manual way at an ad hoc frequency. Action is required from the S&D mgmt. team on a regular basis to enable data validation.	The required and optional fields of data are provided. However, this is mostly done in a manual manner at a standard frequency. S&D mgmt. team on a regular basis to enable data validation.	Automated way of providing the data, including required, optional and miscellaneous fields, provided at a monthly rate. This process still considered to be touch, because the S&D mgmt. team still has to provide support for data validation.	Automated delivery of high data quality, containing most of the fields. Data only has to be validated by S&D Mgmt. team once per year and is thus considered to be a no-touch process.
Data enrichment & refinement	**To what extent is data enrichment and refinement needed?**		The majority of the spend is L1/L2 categorised. A lot of spend is unclassified, the ERP organisational structure is missing and supplier normalisation is no priority.	Automated enrichment process with 40% L3+ or higher. Organisational structures and regions are provided, but only the top suppliers are normalised.	Automated enrichment process with 70% L3+ or higher. Organisational structures and appropriate regions are provided and the top 90% of suppliers is normalised.	All the key reporting dimensions are available and correctly provided. 95% of the spend data contains category level 3+.
Reporting & analytics	**To what extent do the users adopt the reporting and analytics tool (PDW)?**		The users do not always make use of the main reporting & analytics tool nor are the needs made clear. Instead, alternative sources are used for analysis, leading to incomplete results and incorrect actions.	The users have adopted the main reporting & analytics tool but the dashboard do not fully cover the needs. Possible improvements are identified but majority of the opportunities are missed.	The dashboards mostly cover the needs of users to analyse either spend data, manage contract or improve sourcing activities. Opportunities are identified, however, insufficient action is taken to resolve issues or improve the process.	The reporting and analytics tool is able to connect all the systems in the organisation. The dashboards fully cover the needs of users to analyse all the data and processes. Major opportunities are identified and acted upon.
Contract Management (EP2)						
Standardisation	**To what extent is the contract management process managed and standardised?**		A clear approval structure is missing and there is only a minimal availability of templates. There is a risk that contracts contain signatures of unauthorised employees.	A general approval flow is defined by the procurement department but still many exception apply. Good templates are approved by the legal department and available at a central location. However, a lot of communication is needed to approve and sign contracts while the incorrect signature sometimes still ends up in a contract.	Best practices but mainly a manual contract management process. Depending on the contract scope, there is made a distinction between is local, regional and global level. Approval flow defined in collaboration with the legal department and other relevant entities in the organisation (category, sub-categories or outside procurement).	The contract management process is well-defined, standardised and considered to be no-touch. Templates ensure a pre-defined and automated process by covering different scenarios, defining the spend and threshold depending on the organisation, region and/or category. The process is easy to track through a log of history, the approval process is easy and limited to those that are actually authorised.
Contract adoption & compliance	**To what extent are the contracts adopted and complied with?**		New contracts and agreements are put in multiple places, thus lacking a proper overview and full adoption. Communication with the stakeholders is poor and there is no monitoring.	Stakeholders are engaged from the beginning of the process until a contract or agreement is approved and signed. Contracts are placed in a repository without additional features. Contracts are not always complied with and there is a lack of monitoring after the fact.	Besides the standard stakeholder engagement, contracts are also monitored to ensure compliance. There is a central tool to easily access contracts. The end-users are aware about the availability of vendors and their services per category and geography.	The usage and contents of contracts are monitored and analysed on a regular basis, while prioritising the ones with low compliance. There is regular communication with the stakeholders to improve the contract usage.

Contract analytics	**How are the contracts analysed and how is the data used for improvement?**		Analytics are solely focused on expiry dates and planning for next negotiation cycles.	Besides preparing for new negotiation cycles, contracts are also analysed to improve the business deals. However, the focus is mainly on doing business with incumbent suppliers.	A centre of excellence is working together with the business to look into new opportunities for contact improvement by using a tool. This includes analysing previous performance, contract compliance and financial details such as spend and discounts.	The contracted spend is connected directly to the ERP spend for sophisticated analytics. Negotiated discounts and payment terms are monitored and acted upon to increase competitive advantage in future negotiations. Risk programs are in place to flag financial risk, adverse media and supplier sanctions.
Market Intelligence (EP3)						
Market analytics	**How are the Market Intelligence capabilities within the organisation?**		There is no central team to gather and analyse market data. The business is limited to their own resources and market opportunities are missed.	There is a central team that gathers market data. However, the central team has limited resources. Market information is mostly generic and not specifically fitting the needs of the requester (business). Business teams should analyse the data themselves.	There is a central team that analyses the market with the use of several sources of market data. Although there is a lot of data, the central team provides mainly generic reports, with the opportunity to link to business needs with additional analysis. Business teams have no access to the data and are only able to request this from the central team.	There is close collaboration between the requester, the central team and a third-party market data suppliers. There is a wide availability of specific or customised offerings such as reoccurring reports, deep dives for market scans and industry best practices, cost modelling and commodity subscriptions. Business teams are able to access data themselves through a portal or dynamic platform.
Communication and adoption	**How is the awareness of MI's offerings and to what extent is the data provided by MI optimally used?**		Offerings are not known or unclear to the targeted audience and do not fit the team's needs. There is a lack of effort to improve the report contents. The business team fully relies on gathering their own data and act on market experiences.	Offerings are known, but the reports have only a partial fit with the needs of the business team. If the team needs data, they directly contact the central team without looking at the available information. The business's main source of data is still the conversations and interaction with current partners existing suppliers.	Offerings are known, accepted, and used on a regular basis by the team. However, the business team does not make optimal use of the available information. Results and findings are often not implemented in the day-to day business but treated as a one-off discovery. There is still support required from the central team and opportunities are missed to increase the usefulness of the offerings.	Offerings are well-known and are regularly used according to the specific business needs. The reports are integrated in the daily process and the data is efficiently used to create value. The business team makes use of a self-service platform to obtain on-demand procurement intelligence data. The business can provide data and collaborate with the central team to enhance the value of the offering.
E-Sourcing (EP4)						
Sourcing capabilities	**What are the sourcing capabilities?**		No tools used or available. The negotiations and tenders are executed offline.	Standard sourcing tools (i.e. SAP Ariba, Scanmarket, Coupa Standard Sourcing, GEP etc.) are used to capture information, documents and offers from suppliers. Little standardisation is embedded and there is a lack of extensive analytics done directly in online tools.	Templates and standardisation are used and there is a strong push for adoption. E-auctions and sourcing optimisation tools are applied to achieve additional savings and gain time efficiencies on the analysis.	Additional tools from the Industry (Procurement) 4.0 domain are embedded in operations, like Robotic Process Automation to create e-sourcing events, or machine learning to identify key value drivers in sourcing activities.
Organisational structure	**Where are the e-sourcing activities located inside the procurement organisation?**		No clear organisational split between roles and responsibilities regarding e-sourcing activities. There is a lack of in-house experts to execute e-sourcing initiatives.	There's a set of trained employees who can execute e-sourcing initiatives independently, however a third party is required to train internal users and facilitate the execution of complicated e-sourcing initiatives.	Trainings are provided internally by a dedicated Centre of Excellence (CoE). This CoE is the go-to group for support, system administration, and executing complicated e-sourcing initiatives. Skilled e-sourcing employees outside of this CoE are still limited in numbers though, thus making the business/category teams rely massively on this CoE.	Procurement category teams and businesses in markets are running their own e-sourcing activities, backed up by their own system champions (super users). There's an active engagement between these super users and the Centre of Excellence to share best practices, create sourcing templates that facilitate category/business sourcing strategies, etc.
E-sourcing strategy	**Is there a clear strategy regarding E-Sourcing, and how does this relate to the company strategy and underlying category or Region/OpCo strategies?**		E-Sourcing is rarely used and if it is done, only on occasional projects with no clear guidance or strategy towards this.	The organisation is using e-sourcing to capture the majority of tenders in an online platform. However, the quality of the e-tender set up is poor (as an example: no embedded analysis or questionnaire scoring).	E-sourcing is perceived as a key enabler of additional benefits. The goal is to drive more adoption and to educate the internal user community on how to create best-in-class set ups. The organisation is starting to measure, monitor and manage the performance and adoption.	There's a clear link between the organisation's (e-)sourcing strategy and the organisational goals of the company. The e-sourcing strategy is broken down on category level, having specifically tailored templates to automate and optimise tendering activities. Clear KPIs are set and measured to drive the continuous growth of adoption across the entire organisation. (Super)Users are trained and educated on this. A continuous development of Roadmap plans & initiatives is discussed to further drive the adoption and performance of (e-)sourcing activities.

Transactional Procurement (EP5)						
As-is situation	**What is the level of control regarding the P2P processes and to what extent are they automated?**		End-to-end P2P process is fully manual. Paper invoices are the majority of purchase orders.	Partial automation, mostly focused on invoice processing. Administration is in order but lacks efficiency.	Majority of the P2P process is automated, including possible Optical Character Recognition (OCR). Receipt of goods/services is done directly in the system and matched with POs and invoices.	A no-touch process with a fully automated two or three-way match. Approval is also possible on mobile devices. Possible manual handling of invoice discrepancy.
Quality and availability of P2P data	**What is the availability of P2P Data and the corresponding quality?**		Low availability of the data and a lack of a clear overview. The quality is insufficient and unreliable. The data cannot be trusted and no actions can be taken.	There is limited data available and the quality should be questioned. Partial automation is in place but mainly restricted to invoice processing. There is still no lack of a clear overview to ensure compliance.	Most of the data is available through automation. Quality is sufficiently accurate to analyse data. However, there is still some level of incompleteness.	The data is automatically processed through the use of an e-P2P tool. The necessary data is available and the quality is considered reliable. Reports can be retrieved from the system without the need to continuously validate the data.
P2P metrics and reporting	**To what extent do you use metrics and KPIs to manage and challenge the transactional process?**		There are no formal P2P metrics or KPIs in place. There is a lack of reporting to higher management to mitigate risks.	There are some formal P2P metrics and KPIs in place. However, there is still the need to learn how to utilise this properly. Reporting is in place but results are not realised.	P2P metrics and KPIs are in place to manage the P2P process but lack a proper baseline. Reporting is not reaching its full potential yet due to different formats.	P2P metrics and KPIs are utilised to manage the process and following a baseline. The report format is company standardised and includes goals that will promote improvement.
Supplier Relationship Management (EP6)						
Supplier performance review	**To what extent is supplier performance measured and how responsive is the organisation?**		Incidental form of performance review and very limited in both directions. The supplier base is unorganised and only the top suppliers are taken into account.	Incidental form of performance review but mostly unilateral. The focus is on the supplier performance and a structured overview of the entire supplier base is lacking.	Supplier performance is regularly assessed including the company's way of working. Although the supplier base is harmonised and cleansed, the corresponding data is not used in to full potential and lacks a sufficient response from the company.	Sophisticated systems (i.e. PDW, eP2P) are in place to gather and store performance data, including the creation of advanced scorecards. Assessment is frequently executed in two directions to enhance existing relationships and establish new ones. If needed, the company responds accordingly and uses the performance reviews to minimise the supplier base.
Supplier risk assessment	**How are supplier risks analysed and managed?**		Only a small number of suppliers is assessed for risks, reaching a minimum amount of spend coverage.	80% or more of the spend is covered in the risk assessment. However, risks at smaller suppliers are ignored.	Mitigation actions are in place. The company acknowledges the risk is usually at the smaller suppliers while the focus is still on the major spend.	Mitigation actions are in place in combination with a risk-based approach. The focus is on controversy and bundling of small but high-risk suppliers. The majority of risks are covered by using a compliance tracker and thus tracking and flagging financial risk and adverse media, ensuring full compliance.
Segmentation & value creation	**To what extent are suppliers segmented and how are the relationships defined?**		Supplier segmentation is done in bits and pieces but not in a structural way on a category level.	The supplier base is segmented in a structural way and activities are focused and executed.	The supplier base is segmented and partnerships and collaborations are established with primarily incumbent suppliers to create value in areas such as innovation and sustainability.	The supplier base is segmented and collaborations are established outside known supplier base through joint ventures and cross-functional partnerships. There is an organisational platform available to create value in areas such as innovation and sustainability to have a bottom-line impact.

Model of H. Schiele used as baseline. Please refer to Supply-management maturity, cost savings and purchasing absorptive capacity: Testing the procurement–performance link. Journal of Purchasing & Supply Management 13 (2007)

Enhanced by Menno van Dijk in 2021. Spend management (OS2) + 6.PEx dimension

Appendix J: Assessment Template

Table J.1: Example of the Microsoft Excel template to process Maturity Assessments

Function	Questions for Analysis	Stage 1 (0% - 25%)	Stage 2 (26% - 50%)	Stage 3 (51% - 75%)	Stage 4 (76% - 100%)	Item Name	Item-0001	Item-0002
						Organisation level 1	Corporate Group	Corporate Group
						Organisation level 2	Entity A	Entity A
						Organisation level 3	Unit A	Unit A
						Organisation level 4	Sub-unit A1	Sub-unit A1
						Organisation level 5	A1-I	A1-II
1. Procurement Planning (PL)								
Demand Planning (PL1)								
Process	To what degree is purchasing involved in the project/product planning? Is this a documented and revolving process?	Product or project planning is sporadically known to purchasing.	Dedicated purchasing personnel are informed about product or project planning. Purchasing has access to demand planning systems.	Purchasing is integrated into product and project planning and utilises existing demand planning systems. Purchasing inclusion points are defined in the process documentation.	Early involvement of purchasing in product and project planning is always ensured. Planning results are an integrative component of the purchasing strategy.	PL1-Process		
Assessment of Demand	Where are requirements and demands derived from? How is the process described?	Demands are partly derived from sales or order income prognosis/forecasts.	Demands are derived from sales or order income prognosis/forecasts and planned for significant commodity areas.	Demands are derived systematically and in structured fashion from sales or order income prognosis/forecasts. Procurement market facts are remedially considered.	Pro-active demand control on the basis of procurement market facts and product life-cycles (Product Lifecycle Management).	PL1-Assessment of Demand		
Pooling Planning (PL2)								
Planning	Are commodities analysed for group-wide pooling potential? Does this regularly happen to all commodities?	Occasional analysis of selected commodities.	All commodities are analysed based on commodity code data.	Complete purchasing volume is permanently analysed in regard to pooling opportunities. Results are documented.	Future demands are analysed regularly of their pooling opportunities Cross-functional partners are involved.	PL2-Planning		
Mandates	How are negotiation mandates and responsibilities defined? Are there group-wide procedures established?	Regulation of negotiation mandates and responsibilities is planned.	Negotiation mandates and responsibilities are partially regulated for single commodities.	Negotiation mandates and responsibilities are regulated. Process applied for all commodities.	Negotiation mandates are delegated and responsibilities are clearly defined on a global basis. Mandates are actively applied.	PL2-Mandates		
IT Support	Which IT tools support you when analysing and managing poolable demand?	Insufficient application of IT tools for pooling (e.g. Excel or similar IT-tools).	Application for a business unit wide IT tool for pooling.	Application of a uniform IT-tool for group-wide pooling.	Application of an integrative intranet-based IT tool for corporate-pooling? Intranet based preferred parts and preferred suppliers database used cross-functionally.	PL2-IT Support		
Environment scanning (PL3)								
Process	How is the process of a supply market analysis described and documented?	Process is described unsatisfying.	Process is partially described.	Process is documented and applied.	Processes subject to regular reviews. Cross-functional acceptance and commitment.	PL3-Process		
Resources	Is sufficient personnel allocated to market analysis?	Provision of personnel capacity of supply market analysis is limited available.	Sufficient personnel for market analysis is available. Responsibilities and commodity groups are defined.	Own capacities for market analysis are derived out of the planning process and are available for market scan activities.	Capacities for market analysis (own and where necessary bought) are available. Cross-functional partners can be involved if required.	PL3-Resources		
Cross-functional integration	How are partner functions involved in drawing conclusions out of the analysis results?	Results out of the supply market analysis remains mostly at purchasing.	Less active exchange with other process partners (e.g. Engineering, Sales).	Regular information exchange with partners (e.g. Engineering, Sales).	Exchange of market analysis results occur continuously and protected against non-authorised use.	PL3-Cross-functional integration		

Appendix K: Results Maturity Assessments

Table K.1: Weights based on company spend per OpCo, sub-unit and business unit

Unit	Weight	Subunit	Weight	OpCo	Weight
Unit A	0.3685	A1	0.3685	A1-I	0.273
Unit A		A1		A1-II	0.096
Unit B	0.2231	B1	0.2231	B1-I	0.140
Unit B		B1		B1-II	0.083
Unit C	0.2211	C1	0.0576	C1-I	0.058
Unit C		C2	0.1635	C2-I	0.163
Unit D	0.1873	D1	0.0127	D1-I	0.013
Unit D		D2	0.1746	D2-I	0.175

Table K.2: Results of maturity assessments per domain for every OpCo

			Unit	Unit A	Unit A	Unit B	Unit B	Unit C	Unit C	Unit D	Unit D				
			Sub-unit	A1	A1	B1	B1	C1	C2	D1	D2				
			OpCo	A1-I	A1-II	B1-I	B1-II	C1-I	C2-I	D1-I	D2-I				
Min	Max	Avg	Weight	0.273	0.096	0.140	0.083	0.058	0.163	0.013	0.175	Max	Functions	Actual	Weighted
2	6	4	PL1-subtotal	2	2	5	4	3	3	4	6	8	2	45%	44%
3	9	6	PL2-subtotal	9	9	4	4	6	5	3	9	12	3	51%	58%
5	7	6	PL3-subtotal	5	5	5	5	5	7	5	7	12	3	46%	47%
2	3	3	PL4-subtotal	2	2	3	3	3	3	3	3	8	2	34%	33%
15	25	18	PL-subtotal	**18**	**18**	**17**	**16**	**17**	**18**	**15**	**25**	**40**	**10**	**45%**	**47%**
6	12	10	OS1-subtotal	11	11	9	6	10	12	11	11	16	4	63%	65%
6	17	12	OS2-subtotal	17	17	13	6	10	10	10	14	20	5	61%	67%
2	7	5	OS3-subtotal	6	6	6	3	2	4	4	7	8	2	59%	67%
15	34	27	OS-subtotal	**34**	**34**	**28**	**15**	**22**	**26**	**25**	**32**	**44**	**11**	**61%**	**66%**
3	9	7	PO1-subtotal	8	8	8	6	3	6	9	9	12	3	59%	62%
3	6	5	PO2-subtotal	6	6	6	5	3	5	4	6	12	3	43%	46%
3	9	6	PO3-subtotal	5	5	9	9	3	9	3	3	12	3	48%	50%
3	8	5	PO4-subtotal	6	6	8	8	3	5	3	4	12	3	45%	48%
4	8	6	PO5-subtotal	8	8	6	6	4	7	5	5	16	4	38%	41%
2	4	3	PO6-subtotal	2	2	3	3	2	4	2	2	8	2	31%	32%
8	15	12	PO7-subtotal	14	14	11	10	12	15	8	12	24	6	50%	54%
30	51	44	PO-subtotal	**49**	**49**	**51**	**47**	**30**	**51**	**34**	**41**	**96**	**24**	**46%**	**49%**
2	8	5	HR1-subtotal	3	3	8	7	4	4	2	5	8	2	56%	57%
2	6	5	HR2-subtotal	4	4	6	6	6	5	2	6	8	2	61%	63%
3	9	7	HR3-subtotal	6	6	9	9	6	9	3	9	12	3	59%	64%
7	23	17	HR-subtotal	13	13	23	22	16	18	7	20	**28**	7	59%	62%
5	11	8	CO1-subtotal	8	8	7	7	6	11	5	9	12	3	64%	69%
6	12	9	CO2-subtotal	8	8	11	8	9	12	6	11	16	4	57%	60%
3	8	6	CO3-subtotal	8	8	5	4	4	8	3	5	8	2	70%	80%
14	31	22	CO-subtotal	**24**	**24**	**23**	**19**	**19**	**31**	**14**	**25**	**36**	**9**	**62%**	**68%**
4	7	5	EP1-subtotal	7	7	5	5	5	5	4	4	12	3	44%	46%
3	6	5	EP2-subtotal	5	5	3	3	4	6	5	6	12	3	39%	40%
2	5	3	EP3-subtotal	3	3	4	3	2	3	2	5	8	2	39%	43%
3	7	5	EP4-subtotal	6	6	4	4	3	7	3	3	12	3	38%	42%
3	6	5	EP5-subtotal	5	5	5	5	5	6	3	3	12	3	39%	40%
3	8	5	EP6-subtotal	7	7	4	4	3	8	3	4	12	3	42%	47%
20	35	27	EP-subtotal	**33**	**33**	**25**	**24**	**22**	**35**	**20**	**25**	**68**	**17**	**40%**	**43%**
115	179	155	Total	**171**	**171**	**167**	**143**	**126**	**179**	**115**	**168**	**312**	**78**	**50%**	**53%**

Table K.3: Results of maturity assessments per dimension for every OpCo

				Min	15		15		30		7		14		20		115		115		142		158				
				Max	25		34		51		23		31		35		179		179		171		171				
				Avg	18		27		44		17		22		27		155		152		155		165				
			Dimension	PL		OS		PO		HR		CO		EP		Total OpCo		Total Subunit		Total Unit		Weighted		Variance		
Unit	Sub-unit	OpCo	Weight	Sum	%	Sum	%	Sum	%	Sum	%	Sum	%	Sum	%	Sum	%	Sum	%	Sum	%	Sum	%	Δ.	Min	Max
Unit A	A1	A1-I	0.273	18	45%	34	77%	49	51%	13	46%	24	67%	33	49%	171	55%	171	55%	171	55%	171	55%	43	128	214
Unit A	A1	A1-II	0.096	18	45%	34	77%	49	51%	13	46%	24	67%	33	49%	171	55%							43	128	214
Unit B	B1	B1-I	0.140	17	43%	28	64%	51	53%	23	82%	23	64%	25	37%	167	54%	155	50%	155	50%	158	51%	42	125	209
Unit B	B1	B1-II	0.083	16	40%	15	34%	47	49%	22	79%	19	53%	24	35%	143	46%							36	107	179
Unit C	C1	C1-I	0.058	17	43%	22	50%	30	31%	16	57%	19	53%	22	32%	126	40%	126	40%	153	49%	165	53%	32	95	158
Unit C	C2	C2-I	0.163	18	45%	26	59%	51	53%	18	64%	31	86%	35	51%	179	57%	179	57%					45	134	224
Unit D	D1	D1-I	0.013	15	38%	25	57%	34	35%	7	25%	14	39%	20	29%	115	37%	115	37%	142	45%	164	53%	29	86	144
Unit D	D2	D2-I	0.175	25	63%	32	73%	41	43%	20	71%	25	69%	25	37%	168	54%	168	54%					42	126	210
			MAX	40		44		96		28		36		68		312		312		312		312				
			Average		45%		61%		46%		59%		62%		40%		50%		49%		50%		53%			
			Weighted		47%		66%		49%		62%		68%		43%		53%		53%		51%		53%			

Table K.4: Results of maturity assessments for e-procurement for every OpCo

				Min	4		3		2		3		3		3		20		20		23		25				
				Max	7		6		5		7		6		8		35		35		33		33				
				Avg	5		5		3		5		5		5		27		27		27		28				
			Dimension	EP1		EP2		EP3		EP4		EP5		EP6		EP		Total Subunit		Total Unit		Weighted		Variance		
Unit	Sub-unit	OpCo	Weight	Sum	%	Sum	%	Sum	%	Sum	%	Sum	%	Sum	%	Sum	%	Sum	%	Sum	%	Sum	%	Δ.	Min	Max
Unit A	A1	A1-I	0.273	7	58%	5	42%	3	38%	6	50%	5	42%	7	58%	33	49%	33	49%	33	49%	33	49%	8	25	41
Unit A	A1	A1-II	0.096	7	58%	5	42%	3	38%	6	50%	5	42%	7	58%	33	49%							8	25	41
Unit B	B1	B1-I	0.140	5	42%	3	25%	4	50%	4	33%	5	42%	4	33%	25	37%	25	36%	25	36%	25	36%	6	19	31
Unit B	B1	B1-II	0.083	5	42%	3	25%	3	38%	4	33%	5	42%	4	33%	24	35%							6	18	30
Unit C	C1	C1-I	0.058	5	42%	4	33%	2	25%	3	25%	5	42%	3	25%	22	32%	22	32%	29	42%	32	46%	6	17	28
Unit C	C2	C2-I	0.163	5	42%	6	50%	3	38%	7	58%	6	50%	8	67%	35	51%	35	51%					9	26	44
Unit D	D1	D1-I	0.013	4	33%	5	42%	2	25%	3	25%	3	25%	3	25%	20	29%	20	29%	23	33%	25	36%	5	15	25
Unit D	D2	D2-I	0.175	4	33%	6	50%	5	63%	3	25%	3	25%	4	33%	25	37%	25	37%					6	19	31
			MAX	12		12		8		12		12		12		68		68		68		68				
			Functions	3		3		2		3		3		3		17		17		17		17				
			Average		44%		39%		39%		38%		39%		42%		40%		39%		40%		42%			
			Weighted		46%		40%		43%		42%		40%		47%		43%		100%		57%		57%			

Appendix L: Raw Data Maturity Assessments

Table L.1: Data set of maturity assessments including the average (weighted) scores

Unit	Sub-unit	OpCo	Weight	Dimension	Domain	Purchasing function	Stage	Score	Average Score	Weighted score	Avg. Weighted Score
Unit A	A1	A1-I	0.273	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Process	Stage 1 (0-25%)	1		0.273	
Unit A	A1	A1-II	0.096	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Process	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Process	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Process	Stage 2 (26-50%)	2	1.9	0.166	1.9
Unit C	C1	C1-I	0.058	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Process	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Process	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Process	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Process	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Assessment of Demand	Stage 1 (0-25%)	1		0.273	
Unit A	A1	A1-II	0.096	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Assessment of Demand	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Assessment of Demand	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Assessment of Demand	Stage 2 (26-50%)	2	1.8	0.166	1.6
Unit C	C1	C1-I	0.058	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Assessment of Demand	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Assessment of Demand	Stage 1 (0-25%)	1		0.163	
Unit D	D1	D1-I	0.013	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Assessment of Demand	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	1. Procurement Planning (PL)	Demand Planning (PL1)	PL1-Assessment of Demand	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Planning	Stage 2 (26-50%)	2		0.545	
Unit A	A1	A1-II	0.096	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Planning	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Planning	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Planning	Stage 1 (0-25%)	1	1.5	0.083	1.7
Unit C	C1	C1-I	0.058	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Planning	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Planning	Stage 1 (0-25%)	1		0.163	
Unit D	D1	D1-I	0.013	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Planning	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Planning	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Mandates	Stage 4 (76-100%)	4		1.091	
Unit A	A1	A1-II	0.096	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Mandates	Stage 4 (76-100%)	4		0.383	
Unit B	B1	B1-I	0.140	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Mandates	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Mandates	Stage 2 (26-50%)	2	2.6	0.166	3.0
Unit C	C1	C1-I	0.058	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Mandates	Stage 3 (51-75%)	3		0.173	
Unit C	C2	C2-I	0.163	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Mandates	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Mandates	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-Mandates	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-IT Support	Stage 3 (51-75%)	3		0.818	
Unit A	A1	A1-II	0.096	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-IT Support	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-IT Support	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-IT Support	Stage 1 (0-25%)	1	2.0	0.083	2.3
Unit C	C1	C1-I	0.058	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-IT Support	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-IT Support	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-IT Support	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	1. Procurement Planning (PL)	Pooling Planning (PL2)	PL2-IT Support	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Process	Stage 1 (0-25%)	1		0.273	
Unit A	A1	A1-II	0.096	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Process	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Process	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Process	Stage 1 (0-25%)	1	1.5	0.083	1.6
Unit C	C1	C1-I	0.058	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Process	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Process	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Process	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Process	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Resources	Stage 2 (26-50%)	2		0.545	
Unit A	A1	A1-II	0.096	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Resources	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Resources	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Resources	Stage 2 (26-50%)	2	1.6	0.166	1.8
Unit C	C1	C1-I	0.058	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Resources	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Resources	Stage 1 (0-25%)	1		0.163	
Unit D	D1	D1-I	0.013	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Resources	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Resources	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Cross-functional integration	Stage 2 (26-50%)	2		0.545	
Unit A	A1	A1-II	0.096	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Cross-functional integration	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Cross-functional integration	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Cross-functional integration	Stage 2 (26-50%)	2	2.4	0.166	2.4
Unit C	C1	C1-I	0.058	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Cross-functional integration	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Cross-functional integration	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Cross-functional integration	Stage 3 (51-75%)	3		0.038	
Unit D	D2	D2-I	0.175	1. Procurement Planning (PL)	Environment scanning (PL3)	PL3-Cross-functional integration	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology identification	Stage 1 (0-25%)	1		0.273	
Unit A	A1	A1-II	0.096	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology identification	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology identification	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology identification	Stage 1 (0-25%)	1	1.0	0.083	1.0
Unit C	C1	C1-I	0.058	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology identification	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology identification	Stage 1 (0-25%)	1		0.163	
Unit D	D1	D1-I	0.013	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology identification	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology identification	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology roadmaps	Stage 1 (0-25%)	1		0.273	
Unit A	A1	A1-II	0.096	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology roadmaps	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology roadmaps	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology roadmaps	Stage 2 (26-50%)	2	1.8	0.166	1.6
Unit C	C1	C1-I	0.058	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology roadmaps	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology roadmaps	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology roadmaps	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	1. Procurement Planning (PL)	Innovation Planning (PL4)	PL4-Technology roadmaps	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Organisational structure	Stage 4 (76-100%)	4		1.091	
Unit A	A1	A1-II	0.096	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Organisational structure	Stage 4 (76-100%)	4		0.383	
Unit B	B1	B1-I	0.140	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Organisational structure	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Organisational structure	Stage 2 (26-50%)	2	2.8	0.166	3.0
Unit C	C1	C1-I	0.058	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Organisational structure	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Organisational structure	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Organisational structure	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Organisational structure	Stage 2 (26-50%)	2		0.349	

Unit A	A1	A1-I	0.273	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Mandate	Stage 2 (26-50%)	2		0.545	
Unit A	A1	A1-II	0.096	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Mandate	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Mandate	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Mandate	Stage 2 (26-50%)	2	2.6	0.166	2.5
Unit C	C1	C1-I	0.058	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Mandate	Stage 3 (51-75%)	3		0.173	
Unit C	C2	C2-I	0.163	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Mandate	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Mandate	Stage 3 (51-75%)	3		0.038	
Unit D	D2	D2-I	0.175	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Mandate	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Cross-functional integration	Stage 2 (26-50%)	2		0.545	
Unit A	A1	A1-II	0.096	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Cross-functional integration	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Cross-functional integration	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Cross-functional integration	Stage 1 (0-25%)	1	2.3	0.083	2.2
Unit C	C1	C1-I	0.058	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Cross-functional integration	Stage 3 (51-75%)	3		0.173	
Unit C	C2	C2-I	0.163	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Cross-functional integration	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Cross-functional integration	Stage 3 (51-75%)	3		0.038	
Unit D	D2	D2-I	0.175	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Cross-functional integration	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Integration into group	Stage 3 (51-75%)	3		0.818	
Unit A	A1	A1-II	0.096	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Integration into group	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Integration into group	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Integration into group	Stage 1 (0-25%)	1	2.5	0.083	2.6
Unit C	C1	C1-I	0.058	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Integration into group	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Integration into group	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Integration into group	Stage 3 (51-75%)	3		0.038	
Unit D	D2	D2-I	0.175	2. Organisational Structure (OS)	Structure & Mandates (OS1)	OS1-Integration into group	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Understanding and awareness	Stage 4 (76-100%)	4		1.091	
Unit A	A1	A1-II	0.096	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Understanding and awareness	Stage 4 (76-100%)	4		0.383	
Unit B	B1	B1-I	0.140	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Understanding and awareness	Stage 3 (51-75%)	3		0.420	
Unit C	C1	C1-I	0.058	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Understanding and awareness	Stage 3 (51-75%)	3	3.4	0.173	3.3
Unit C	C2	C2-I	0.163	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Understanding and awareness	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Understanding and awareness	Stage 3 (51-75%)	3		0.038	
Unit D	D2	D2-I	0.175	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Understanding and awareness	Stage 4 (76-100%)	4		0.699	
Unit A	A1	A1-I	0.273	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility1	Stage 4 (76-100%)	4		1.091	
Unit A	A1	A1-II	0.096	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility1	Stage 4 (76-100%)	4		0.383	
Unit B	B1	B1-I	0.140	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility1	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility1	Stage 3 (51-75%)	3	2.8	0.249	3.2
Unit C	C1	C1-I	0.058	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility1	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility1	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility1	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility1	Stage 4 (76-100%)	4		0.699	
Unit A	A1	A1-I	0.273	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility2	Stage 3 (51-75%)	3		0.818	
Unit A	A1	A1-II	0.096	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility2	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility2	Stage 3 (51-75%)	3		0.420	
Unit C	C1	C1-I	0.058	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility2	Stage 2 (26-50%)	2	2.3	0.115	2.2
Unit C	C2	C2-I	0.163	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility2	Stage 1 (0-25%)	1		0.163	
Unit D	D1	D1-I	0.013	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility2	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Communication and responsibility2	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Purchasing process	Stage 2 (26-50%)	2		0.545	
Unit A	A1	A1-II	0.096	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Purchasing process	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Purchasing process	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Purchasing process	Stage 1 (0-25%)	1	1.8	0.083	1.8
Unit C	C1	C1-I	0.058	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Purchasing process	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Purchasing process	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Purchasing process	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Purchasing process	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Approach	Stage 4 (76-100%)	4		1.091	
Unit A	A1	A1-II	0.096	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Approach	Stage 4 (76-100%)	4		0.383	
Unit B	B1	B1-I	0.140	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Approach	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Approach	Stage 2 (26-50%)	2	2.6	0.166	2.9
Unit C	C1	C1-I	0.058	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Approach	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Approach	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Approach	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	2. Organisational Structure (OS)	Spend management (OS2)	OS2-Approach	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Board meetings	Stage 3 (51-75%)	3		0.818	
Unit A	A1	A1-II	0.096	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Board meetings	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Board meetings	Stage 4 (76-100%)	4		0.561	
Unit B	B1	B1-II	0.083	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Board meetings	Stage 1 (0-25%)	1	2.8	0.083	2.9
Unit C	C1	C1-I	0.058	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Board meetings	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Board meetings	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Board meetings	Stage 4 (76-100%)	4		0.051	
Unit D	D2	D2-I	0.175	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Board meetings	Stage 4 (76-100%)	4		0.699	
Unit A	A1	A1-I	0.273	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Make-or-Buy decisions	Stage 3 (51-75%)	3		0.818	
Unit A	A1	A1-II	0.096	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Make-or-Buy decisions	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Make-or-Buy decisions	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Make-or-Buy decisions	Stage 2 (26-50%)	2	2.3	0.166	2.5
Unit C	C1	C1-I	0.058	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Make-or-Buy decisions	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Make-or-Buy decisions	Stage 2 (26-50%)	2		0.327	
Unit D	D2	D2-I	0.175	2. Organisational Structure (OS)	Strategic integration (OS3)	OS3-Make-or-Buy decisions	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Sourcing Strategy	Stage 4 (76-100%)	4		1.091	
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Sourcing Strategy	Stage 4 (76-100%)	4		0.383	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Sourcing Strategy	Stage 4 (76-100%)	4		0.561	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Sourcing Strategy	Stage 3 (51-75%)	3	3.1	0.249	3.3
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Sourcing Strategy	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Sourcing Strategy	Stage 1 (0-25%)	1		0.163	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Sourcing Strategy	Stage 4 (76-100%)	4		0.051	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Sourcing Strategy	Stage 4 (76-100%)	4		0.699	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Process supplier selection	Stage 1 (0-25%)	1		0.273	
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Process supplier selection	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Process supplier selection	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Process supplier selection	Stage 1 (0-25%)	1	1.4	0.083	1.4
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Process supplier selection	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Process supplier selection	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Process supplier selection	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Process supplier selection	Stage 2 (26-50%)	2		0.349	

Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Responsibility	Stage 3 (51-75%)	3	2.6	0.818	2.8
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Responsibility	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Responsibility	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Responsibility	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Responsibility	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Responsibility	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Responsibility	Stage 3 (51-75%)	3		0.038	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Strategic Sourcing (PO1)	PO1-Responsibility	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Process documentation	Stage 3 (51-75%)	3	2.0	0.818	2.2
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Process documentation	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Process documentation	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Process documentation	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Process documentation	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Process documentation	Stage 1 (0-25%)	1		0.163	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Process documentation	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Process documentation	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Negotiation	Stage 1 (0-25%)	1	1.8	0.273	1.8
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Negotiation	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Negotiation	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Negotiation	Stage 3 (51-75%)	3		0.249	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Negotiation	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Negotiation	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Negotiation	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Negotiation	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Contract management	Stage 2 (26-50%)	2	1.4	0.545	1.5
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Contract management	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Contract management	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Contract management	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Contract management	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Contract management	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Contract management	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Supplier selection (PO2)	PO2-Contract management	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Process	Stage 3 (51-75%)	3	2.5	0.818	2.7
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Process	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Process	Stage 4 (76-100%)	4		0.561	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Process	Stage 4 (76-100%)	4		0.332	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Process	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Process	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Process	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Process	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Communication with suppliers	Stage 1 (0-25%)	1	1.8	0.273	1.8
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Communication with suppliers	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Communication with suppliers	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Communication with suppliers	Stage 3 (51-75%)	3		0.249	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Communication with suppliers	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Communication with suppliers	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Communication with suppliers	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Communication with suppliers	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Responsibility	Stage 1 (0-25%)	1	1.5	0.273	1.6
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Responsibility	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Responsibility	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Responsibility	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Responsibility	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Responsibility	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Responsibility	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Supplier evaluation (PO3)	PO3-Responsibility	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Process	Stage 2 (26-50%)	2	1.9	0.545	2.0
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Process	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Process	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Process	Stage 3 (51-75%)	3		0.249	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Process	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Process	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Process	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Process	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Optimisation	Stage 1 (0-25%)	1	1.8	0.273	1.7
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Optimisation	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Optimisation	Stage 4 (76-100%)	4		0.561	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Optimisation	Stage 4 (76-100%)	4		0.332	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Optimisation	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Optimisation	Stage 1 (0-25%)	1		0.163	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Optimisation	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Optimisation	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Phase-out	Stage 3 (51-75%)	3	1.8	0.818	2.1
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Phase-out	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Phase-out	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Phase-out	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Phase-out	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Phase-out	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Phase-out	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Supplier development (PO4)	PO4-Phase-out	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Process	Stage 2 (26-50%)	2	1.9	0.545	1.9
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Process	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Process	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Process	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Process	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Process	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Process	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Process	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Cross-functional integration	Stage 2 (26-50%)	2	1.3	0.545	1.4
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Cross-functional integration	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Cross-functional integration	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Cross-functional integration	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Cross-functional integration	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Cross-functional integration	Stage 1 (0-25%)	1		0.163	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Cross-functional integration	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Cross-functional integration	Stage 1 (0-25%)	1		0.175	

Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Standardisation	Stage 2 (26-50%)	2	1.6	0.545	1.9
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Standardisation	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Standardisation	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Standardisation	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Standardisation	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Standardisation	Stage 4 (76-100%)	4		0.654	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Standardisation	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Standardisation	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Material/functional release	Stage 2 (26-50%)	2	1.6	0.545	1.4
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Material/functional release	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Material/functional release	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Material/functional release	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Material/functional release	Stage 1 (0-25%)	1		0.058	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Material/functional release	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Purchasing early involvement in Development process (PO5)	PO5-Material/functional release	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Early supplier Involvement	Stage 1 (0-25%)	1	1.4	0.273	1.4
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Early supplier Involvement	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Early supplier Involvement	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Early supplier Involvement	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Early supplier Involvement	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Early supplier Involvement	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Early supplier Involvement	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Early supplier Involvement	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Technology roadmaps	Stage 1 (0-25%)	1	1.1	0.273	1.2
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Technology roadmaps	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Technology roadmaps	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Technology roadmaps	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Technology roadmaps	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Technology roadmaps	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Technology roadmaps	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Early supplier involvement Process (PO6)	PO6-Technology roadmaps	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement marketing	Stage 1 (0-25%)	1	1.0	0.273	1.0
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement marketing	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement marketing	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement marketing	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement marketing	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement marketing	Stage 1 (0-25%)	1		0.163	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement marketing	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement marketing	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement quality	Stage 3 (51-75%)	3	2.4	0.818	2.6
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement quality	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement quality	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement quality	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement quality	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement quality	Stage 4 (76-100%)	4		0.654	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement quality	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement quality	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement logistics and production	Stage 2 (26-50%)	2	2.0	0.545	2.0
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement logistics and production	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement logistics and production	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement logistics and production	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement logistics and production	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement logistics and production	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement logistics and production	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement logistics and production	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Logistics targets	Stage 2 (26-50%)	2	2.1	0.545	2.2
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Logistics targets	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Logistics targets	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Logistics targets	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Logistics targets	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Logistics targets	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Logistics targets	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Logistics targets	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement operative procurement	Stage 3 (51-75%)	3	2.9	0.818	2.8
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement operative procurement	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement operative procurement	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement operative procurement	Stage 3 (51-75%)	3		0.249	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement operative procurement	Stage 3 (51-75%)	3		0.173	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement operative procurement	Stage 2 (26-50%)	2		0.327	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement operative procurement	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement risk management	Stage 3 (51-75%)	3	2.0	0.818	2.3
Unit A	A1	A1-II	0.096	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement risk management	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement risk management	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement risk management	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement risk management	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement risk management	Stage 4 (76-100%)	4		0.654	
Unit D	D1	D1-I	0.013	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement risk management	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	3. Process Organisation (PO)	Process involvement with other functions (PO7)	PO7-Involvement risk management	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Functions	Stage 2 (26-50%)	2	2.5	0.545	2.7
Unit A	A1	A1-II	0.096	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Functions	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Functions	Stage 4 (76-100%)	4		0.561	
Unit B	B1	B1-II	0.083	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Functions	Stage 3 (51-75%)	3		0.249	
Unit C	C1	C1-I	0.058	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Functions	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Functions	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Functions	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Functions	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Technical competence	Stage 1 (0-25%)	1	2.0	0.273	1.9
Unit A	A1	A1-II	0.096	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Technical competence	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Technical competence	Stage 4 (76-100%)	4		0.561	
Unit B	B1	B1-II	0.083	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Technical competence	Stage 4 (76-100%)	4		0.332	
Unit C	C1	C1-I	0.058	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Technical competence	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Technical competence	Stage 1 (0-25%)	1		0.163	
Unit D	D1	D1-I	0.013	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Technical competence	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	4. Human Resources & Leadership (HR)	Job description and competencies (HR1)	HR1-Technical competence	Stage 2 (26-50%)	2		0.349	

Unit A	A1	A1-I	0.273	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Selection	Stage 3 (51-75%)	3	3.1	0.818	3.3
Unit A	A1	A1-II	0.096	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Selection	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Selection	Stage 4 (76-100%)	4		0.561	
Unit B	B1	B1-II	0.083	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Selection	Stage 4 (76-100%)	4		0.332	
Unit C	C1	C1-I	0.058	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Selection	Stage 4 (76-100%)	4		0.230	
Unit C	C2	C2-I	0.163	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Selection	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Selection	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Selection	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Integration	Stage 1 (0-25%)	1	1.8	0.273	1.8
Unit A	A1	A1-II	0.096	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Integration	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Integration	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Integration	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Integration	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Integration	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Integration	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	4. Human Resources & Leadership (HR)	Personnel selection and integration (HR2)	HR2-Integration	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Target agreements	Stage 3 (51-75%)	3	2.6	0.818	2.9
Unit A	A1	A1-II	0.096	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Target agreements	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Target agreements	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Target agreements	Stage 3 (51-75%)	3		0.249	
Unit C	C1	C1-I	0.058	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Target agreements	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Target agreements	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Target agreements	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Target agreements	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Career development	Stage 2 (26-50%)	2	2.4	0.545	2.5
Unit A	A1	A1-II	0.096	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Career development	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Career development	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Career development	Stage 3 (51-75%)	3		0.249	
Unit C	C1	C1-I	0.058	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Career development	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Career development	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Career development	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Career development	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Feedback process	Stage 1 (0-25%)	1	2.1	0.273	2.2
Unit A	A1	A1-II	0.096	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Feedback process	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Feedback process	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Feedback process	Stage 3 (51-75%)	3		0.249	
Unit C	C1	C1-I	0.058	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Feedback process	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Feedback process	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Feedback process	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	4. Human Resources & Leadership (HR)	Performance appraisal & Career development (HR3)	HR3-Feedback process	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target result definition	Stage 2 (26-50%)	2	2.4	0.545	2.5
Unit A	A1	A1-II	0.096	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target result definition	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target result definition	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target result definition	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target result definition	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target result definition	Stage 4 (76-100%)	4		0.654	
Unit D	D1	D1-I	0.013	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target result definition	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target result definition	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target break-down	Stage 3 (51-75%)	3	2.8	0.818	2.9
Unit A	A1	A1-II	0.096	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target break-down	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target break-down	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target break-down	Stage 3 (51-75%)	3		0.249	
Unit C	C1	C1-I	0.058	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target break-down	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target break-down	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target break-down	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Target break-down	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Measurement figures	Stage 3 (51-75%)	3	2.5	0.818	2.9
Unit A	A1	A1-II	0.096	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Measurement figures	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Measurement figures	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Measurement figures	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Measurement figures	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Measurement figures	Stage 4 (76-100%)	4		0.654	
Unit D	D1	D1-I	0.013	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Measurement figures	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	5. Purchasing Controlling (CO)	Controlling systems (CO1)	CO1-Measurement figures	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Organisational structure	Stage 2 (26-50%)	2	2.1	0.545	2.1
Unit A	A1	A1-II	0.096	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Organisational structure	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Organisational structure	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Organisational structure	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Organisational structure	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Organisational structure	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Organisational structure	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Organisational structure	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Responsibility	Stage 2 (26-50%)	2	2.6	0.545	2.7
Unit A	A1	A1-II	0.096	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Responsibility	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Responsibility	Stage 4 (76-100%)	4		0.561	
Unit B	B1	B1-II	0.083	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Responsibility	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Responsibility	Stage 3 (51-75%)	3		0.173	
Unit C	C2	C2-I	0.163	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Responsibility	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Responsibility	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Responsibility	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Target controlling process	Stage 2 (26-50%)	2	2.1	0.545	2.3
Unit A	A1	A1-II	0.096	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Target controlling process	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Target controlling process	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Target controlling process	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Target controlling process	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Target controlling process	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Target controlling process	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Target controlling process	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Measurement controlling process	Stage 2 (26-50%)	2	2.3	0.545	2.5
Unit A	A1	A1-II	0.096	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Measurement controlling process	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Measurement controlling process	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Measurement controlling process	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Measurement controlling process	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Measurement controlling process	Stage 4 (76-100%)	4		0.654	
Unit D	D1	D1-I	0.013	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Measurement controlling process	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	5. Purchasing Controlling (CO)	Controlling process & Structure (CO2)	CO2-Measurement controlling process	Stage 3 (51-75%)	3		0.524	

Unit A	A1	A1-I	0.273	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-Commodity codes	Stage 4 (76-100%)	4	2.9	1.091	3.3
Unit A	A1	A1-II	0.096	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-Commodity codes	Stage 4 (76-100%)	4		0.383	
Unit B	B1	B1-I	0.140	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-Commodity codes	Stage 3 (51-75%)	3		0.420	
Unit B	B1	B1-II	0.083	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-Commodity codes	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-Commodity codes	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-Commodity codes	Stage 4 (76-100%)	4		0.654	
Unit D	D1	D1-I	0.013	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-Commodity codes	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-Commodity codes	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-IT Support	Stage 4 (76-100%)	4	2.8	1.091	3.1
Unit A	A1	A1-II	0.096	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-IT Support	Stage 4 (76-100%)	4		0.383	
Unit B	B1	B1-I	0.140	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-IT Support	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-IT Support	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-IT Support	Stage 3 (51-75%)	3		0.173	
Unit C	C2	C2-I	0.163	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-IT Support	Stage 4 (76-100%)	4		0.654	
Unit D	D1	D1-I	0.013	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-IT Support	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	5. Purchasing Controlling (CO)	Controlling Methods & Tools (CO3)	CO3-IT Support	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data gathering	Stage 3 (51-75%)	3	2.3	0.818	2.4
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data gathering	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data gathering	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data gathering	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data gathering	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data gathering	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data gathering	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data gathering	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data enrichment & refinement	Stage 2 (26-50%)	2	1.8	0.545	1.8
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data enrichment & refinement	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data enrichment & refinement	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data enrichment & refinement	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data enrichment & refinement	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data enrichment & refinement	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data enrichment & refinement	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Data enrichment & refinement	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Reporting & analytics	Stage 2 (26-50%)	2	1.3	0.545	1.4
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Reporting & analytics	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Reporting & analytics	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Reporting & analytics	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Reporting & analytics	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Reporting & analytics	Stage 1 (0-25%)	1		0.163	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Reporting & analytics	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Spend & data management (EP1)	EP1-Reporting & analytics	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Contract management (EP2)	EP2-Standardisation	Stage 1 (0-25%)	1	1.4	0.273	1.4
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Contract management (EP2)	EP2-Standardisation	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Contract management (EP2)	EP2-Standardisation	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Contract management (EP2)	EP2-Standardisation	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Contract management (EP2)	EP2-Standardisation	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Contract management (EP2)	EP2-Standardisation	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Contract management (EP2)	EP2-Standardisation	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Contract management (EP2)	EP2-Standardisation	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract adoption & compliance	Stage 2 (26-50%)	2	1.8	0.545	1.8
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract adoption & compliance	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract adoption & compliance	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract adoption & compliance	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract adoption & compliance	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract adoption & compliance	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract adoption & compliance	Stage 2 (26-50%)	2		0.025	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract adoption & compliance	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract analytics	Stage 2 (26-50%)	2	1.5	0.545	1.7
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract analytics	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract analytics	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract analytics	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract analytics	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract analytics	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract analytics	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Contract management (EP2)	EP2-Contract analytics	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Market analytics	Stage 2 (26-50%)	2	1.6	0.545	1.8
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Market analytics	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Market analytics	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Market analytics	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Market analytics	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Market analytics	Stage 1 (0-25%)	1		0.163	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Market analytics	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Market analytics	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Communication and adoption	Stage 1 (0-25%)	1	1.5	0.273	1.7
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Communication and adoption	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Communication and adoption	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Communication and adoption	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Communication and adoption	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Communication and adoption	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Communication and adoption	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Market Intelligence (EP3)	EP3-Communication and adoption	Stage 3 (51-75%)	3		0.524	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Sourcing capabilities	Stage 2 (26-50%)	2	1.6	0.545	1.8
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Sourcing capabilities	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Sourcing capabilities	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Sourcing capabilities	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Sourcing capabilities	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Sourcing capabilities	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Sourcing capabilities	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Sourcing capabilities	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Organisational structure	Stage 3 (51-75%)	3	1.6	0.818	1.9
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Organisational structure	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Organisational structure	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Organisational structure	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Organisational structure	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Organisational structure	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Organisational structure	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-Organisational structure	Stage 1 (0-25%)	1		0.175	

Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-E-sourcing strategy	Stage 1 (0-25%)	1	1.3	0.273	1.3
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-E-sourcing strategy	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-E-sourcing strategy	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-E-sourcing strategy	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-E-sourcing strategy	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-E-sourcing strategy	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-E-sourcing strategy	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Sourcing activities (EP4)	EP4-E-sourcing strategy	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-As-is situation	Stage 2 (26-50%)	2	1.8	0.545	1.8
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-As-is situation	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-As-is situation	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-As-is situation	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-As-is situation	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-As-is situation	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-As-is situation	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-As-is situation	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-Quality and availability of P2P data	Stage 2 (26-50%)	2	1.8	0.545	1.8
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-Quality and availability of P2P data	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-Quality and availability of P2P data	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-Quality and availability of P2P data	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-Quality and availability of P2P data	Stage 2 (26-50%)	2		0.115	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-Quality and availability of P2P data	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-Quality and availability of P2P data	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-Quality and availability of P2P data	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-P2P metrics and reporting	Stage 1 (0-25%)	1	1.1	0.273	1.2
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-P2P metrics and reporting	Stage 1 (0-25%)	1		0.096	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-P2P metrics and reporting	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-P2P metrics and reporting	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-P2P metrics and reporting	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-P2P metrics and reporting	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-P2P metrics and reporting	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Transactional procurement (EP5)	EP5-P2P metrics and reporting	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier performance review	Stage 2 (26-50%)	2	1.9	0.545	2.1
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier performance review	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier performance review	Stage 2 (26-50%)	2		0.280	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier performance review	Stage 2 (26-50%)	2		0.166	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier performance review	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier performance review	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier performance review	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier performance review	Stage 2 (26-50%)	2		0.349	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier risk assessment	Stage 3 (51-75%)	3	1.8	0.818	2.1
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier risk assessment	Stage 3 (51-75%)	3		0.287	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier risk assessment	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier risk assessment	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier risk assessment	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier risk assessment	Stage 3 (51-75%)	3		0.490	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier risk assessment	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Supplier risk assessment	Stage 1 (0-25%)	1		0.175	
Unit A	A1	A1-I	0.273	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Segmentation & value creation	Stage 2 (26-50%)	2	1.4	0.545	1.5
Unit A	A1	A1-II	0.096	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Segmentation & value creation	Stage 2 (26-50%)	2		0.192	
Unit B	B1	B1-I	0.140	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Segmentation & value creation	Stage 1 (0-25%)	1		0.140	
Unit B	B1	B1-II	0.083	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Segmentation & value creation	Stage 1 (0-25%)	1		0.083	
Unit C	C1	C1-I	0.058	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Segmentation & value creation	Stage 1 (0-25%)	1		0.058	
Unit C	C2	C2-I	0.163	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Segmentation & value creation	Stage 2 (26-50%)	2		0.327	
Unit D	D1	D1-I	0.013	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Segmentation & value creation	Stage 1 (0-25%)	1		0.013	
Unit D	D2	D2-I	0.175	6. E-Procurement (EP)	Supplier Relationship management (EP6)	EP6-Segmentation & value creation	Stage 1 (0-25%)	1		0.175	