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Iida Pyymäki

PERFORMANCE MEASUREMENT AND IMPLEMENTATION OF E-PROCUREMENT SYSTEM IN INDIRECT PURCHASING

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1st examiner: Jukka Hallikas

2nd examiner: Holger Schiele (University of Twente)

ABSTRACT

Author:	Iida Pyymäki
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Internet has completely changed the way business is done nowadays. Recently, due to the great benefits of e-procurement, such as efficiency and costs savings, companies are applying e-procurement in indirect purchasing. However, implementation of e-procurement is a complex process and therefore, factors such as performance measurement and change management are needed. The aim of the thesis is to examine implementation of an e-procurement in indirect purchasing in a case company. The focus is on measuring of the e-procurement system, finding the most relevant benefits of the system for the case company and finding the best practices to implement the system into the case organization. The base for the research was found on former academic research related to the relevant concepts. The research was conducted as a qualitative case study and the employees of the case company were interviewed for this study. Based on the analyzes of the interviews it can be concluded that the most significant benefits of e-procurement are increased internal control, cost savings, faster order and invoice processing and efficient overall process. The greatest success factor of implementation is acceptance of the end-users, which can be achieved by, for example, training and communication.

TIIVISTELMÄ

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Yritystenvälinen kaupankäynti on siirtynyt internettiin, mikä on tarjonnut mahdollisuuden tehostaa hankintaprosessi myös epäsuorissa hankinnoissa. Sähköisen hankinnan suurimpia etuja ovat esimerkiksi kustannussäästöt ja tehokkuus. Eduista huolimatta, sähköisen hankinnan implementointi on usein haastavaa, minkä vuoksi esimerkiksi suorituskyvyn mittaaminen ja muutosjohtaminen ovat tärkeissä rooleissa implementoinnissa. Tämän tutkimuksen tavoitteena oli tutkia sähköisen hankinnan implementointiprosessia epäsuorissa hankinoissa sekä löytää implementointia tukevat mittarit, merkittävimmät hyödyt ja parhaat käytänteet case-yritykselle. Tutkimus pohjautuu aiempaan akateemiseen kirjallisuuteen ja se toteutettiin laadullisena tutkimuksena, jossa haastateltiin case-yrityksen työntekijöitä. Haastatteluihin perustuen voidaan todeta, että sähköisen hankinnan merkittävimmät hyödyt ovat kasvanut sisäinen kontrolli, kustannussäästöt, tilausten ja laskujen nopeampi prosessointi sekä kokonaisvaltaisesti tehokkaampi hankintaprosessi. Implementoinnin kannalta tärkein rooli on loppukäyttäjillä ja heidän hyväksynnällä, joka voidaan saavuttaa esimerkiksi riittävän koulutuksen ja onnistuneen kommunikoinnin avulla.

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In Vantaa, 3.8.2018

Iida Pyymäki

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1 INTRODUCTION

The first part of this thesis, introduction, firstly discusses the background of the research and points out the motivation to conduct a study. Then, the research problem and research questions are proposed and discussed, and research gap is explained to further. In addition, theoretical framework for the study is presented and the structure of the research is introduced. Lastly, some of the key concepts and terms are defined.

1.1 Background

The importance of purchasing department has been more and more understood in companies and especially, purchasing performance has been seen as an important element when it comes to corporate performance (Easton et al., 2002). Therefore, one of the most important tasks of strategic purchasing has been recognized to improve the financial and commercial performance of a company (González-Benito, 2007). By capturing and sharing information in real-time, companies are able to improve their supply chain performance (Devaraj et al., 2007) and hence, information technologies are in a key role to provide real-time information among the members of a supply chain.

The introduction of internet and electronics, known also as the third industrial revolution, changed once again the way how business is done by further automating manufacturing. Automation has been introduced to purchasing too and consequently, companies have been able to reduce manual work done by humans and instead let electronic systems do the work in order to better utilize the valuable and costly human capital. Therefore, well performing and efficient IT system is a must have for all organizations nowadays to be able to participate business and to be competitive, especially in growing global markets. Different e-business solutions

provide useful systems and technologies from customer relationship management to whole supply chain management (Chang et al., 2004).

When it comes to supply chains and managing them, especially electronic procurement (e-procurement) has an important role in ensuring the functionality of supply chain. As a quite resent phenomenon, e-procurement has become a must-have for companies, regardless the industry, to improve supply chain competitiveness (Pop Sitar, 2011). Furthermore, when companies are starting to adopt and develop their e-commerce strategies, e-procurement is often the starting point. The first e-procurement systems, mostly enterprise resource planning (ERP) systems, started to come around in business in the 1980s (Puschmann & Alt, 2005). However, those e-procurement systems were mostly designed for direct procurement and finally, in the late 1990s, first e-procurement systems for indirect purchasing were introduced (Puschmann & Alt, 2005). Compared to traditional ERP systems, the e-procurement systems for indirect procurement systems were less expensive and more flexible because of standardization on a technical level (Puschmann & Alt, 2005). Later on, the development of electronic markets (e-markets) and systems vendors, such as Ariba and SAP, have supported the outsourcing of operational purchasing functions (Puschmann & Alt, 2005). More recently, the introduction of purchase-to-pay systems, which are one form of e-procurement systems, has increased the efficiency of the whole purchase-to-pay process since companies have been able to automate tasks, such as invoice matching, that have been done manually earlier (Yu et al., 2008).

In many companies, the role of e-procurement has become established when purchasing raw materials, components and products which are directly used in the manufacturing process of a company’s own products and services. However, products and services which are not directly related to manufacturing process can sometimes be undervalued and, therefore, the processes and systems related to indirect products and services can lack in terms of attention and development in the eyes of managers. (Kim & Shunk, 2004) Due to the lack of recognition, by

implementing e-procurement into indirect purchasing, it may be possible to achieve significant benefits, such as cost (Ramkumar, 2016) and time savings, process efficiency (Kim & Shunk, 2004) and increased overall supply chain management (Yu et al., 2008). Hence, the relationship between e-procurement and indirect procurement should be considered even more (Chang et al., 2004).

A common distress causing event for an organization is an implementation process of new IT system. Adoption of e-procurement system requires more than technological competence; extensive change management effort is needed to create a more productive purchasing culture (Gardenal, 2013). Change management and effective change management plan are significant factors in e-procurement implementation since without proper change management, there is a high risk to fail the whole adoption process due to resistance to change (Panda & Sahu, 2012). Typically, when organizations adopt new information systems, there are more or less significant changes in employees' work and hence, it has been argued that change efforts should be focused on the people who are affected to break the possible change resistance (Markus, 2004).

This research focuses on the implementation process of e-procurement system in the case company in a construction and mining industry. The aim is to find out which factors support the implementation of an e-procurement system as successfully as possible and which kind of factors should be considered during the implementation to avoid potentially barriers. This main research question can be answered by finding the benefits of e-procurement system adoption, finding ways to effectively measure the benefits achieved from e-procurement and lastly, recognizing how e-procurement systems can be helpful to manage purchasing process and increasing control. Finally, one of the purposes of the research is to propose how to better manage the purchasing process of the company and improve risk management by using e-procurement.

1.2 Research questions, gap and objectives

E-procurement systems have especially a significant impact on the P2P process (Trkman & McCormack, 2010). Since indirect purchasing has not received as much attention as direct purchasing in terms of e-procurement (Kim & Shunk, 2004), the impact of e-procurement systems on indirect procurement should be investigated, since based on the literature on e-procurement direct procurement, there has been lots of benefits achieved by implementing e-procurement systems. This study aims to find the factors that make the implementation process successful and therefore, the main research question is:

"What kind of factors should be considered to successfully implement an e-procurement for indirect purchasing?"

Successful implementation of an e-procurement system in a company consists of numbers of factors, one of them being change management (Gardenal, 2013). There is usually resistance to change in organizations (Markus, 2004) and therefore, it is highly important to manage change in the implementation process (Panda & Sahu, 2012). Measuring the benefits arising from the e-procurement system is needed in order to determine the actual advantages that the system provides and hence helping with the implementation process. Lastly, e-procurement systems help to manage purchase-to-pay process and decrease risks related to procurement process (Ronchi et al., 2010), which both make it easier to implement an e-procurement system. To support the main research question, there are three sub-questions proposed:

"How to successfully manage change in e-procurement implementation process?",

"How to measure the benefits achieved by using the e-procurement system?"

and

“How to better manage purchase-to-pay process and avoid risks by using e-procurement?”

Theoretical contribution of this research is to add academic knowledge of the studied objects. For example, indirect purchasing departments are still lacking behind direct sourcing and therefore, there are not as many studies focused on indirect purchasing, especially in the context of web-based e-procurement system implementation. Therefore, this study aims to deepen academic knowledge related to specifically indirect purchasing department and how there are some special characteristics when implementing e-procurement for this department compared to direct sourcing.

Practical contributions of the study are going to support the indirect purchasing department and the middle management to understand the current problems even clearer. Then the study will aim to identify the greatest barriers or challenges related to e-procurement adoption among the employees and find ways to overcome those problems in order to increase the possibility to success in the implementation process. Hence, one of the practical contributions is to involve the employees into the process and communicate the needs of employees to the implementation project group. In addition, this research gives practical proposes how to measure the benefits that can be achieved by the e-procurement system. Managers are going to have information about indirect purchasing related risks and how the risks can be avoided by using e-procurement system. Lastly, the findings of this research can be used when the case company decides to implement the system for other countries.

1.3 Theoretical framework and limitations

Theoretical framework presented in Figure 1 visualizes the relations between the key concepts and the research questions.

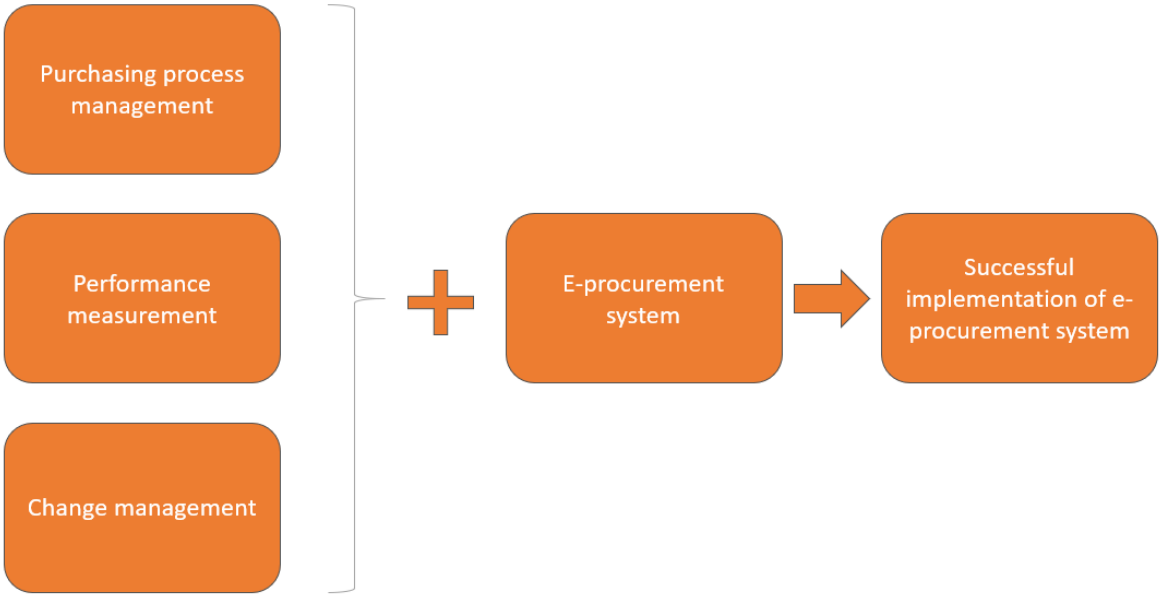

Figure 1. Theoretical framework

The study is mainly about the indirect procurement point of view since the e-procurement system will be implemented in indirect purchasing in the case company. Hence, direct procurement department will not be separately examined in this study. However, in the previous literature, the literature related to indirect procurement is occasionally clearly limited, making it necessary to use literature related to direct purchases when it is fitting to indirect purchasing. The study will be focused on web-based e-procurement systems in the empirical part since the implemented e-procurement system is a web-based system in the case company. The implementation process of the e-procurement system has not been examined from the supplier point of view. Lastly, the object of this study was only to develop potential measurements to measure the benefits achieved by implementing the e-procurement system and hence, the implementation of the measurements will not be discussed in the study.

The results might be useful quite generally in the field of indirect purchasing in construction and mining industries since indirect purchases among those companies are likely to be quite similar and hence, are likely to have similar kinds

of issues when implementing e-procurement. However, although there are similar practices among the companies in the same field, it should be kept in mind that as usually in case studies, the results cannot be directly generalized to other companies. For instance, the e-procurement system is customized for the case company, limiting the generalization of the benefits of the implementation. In addition, the measurement introduced in the study are based on the goals and objectives of the company and therefore, they might not be generalizable.

1.4 Structure of the research

This research consists of introduction of the research, theoretical part, methodology, empirical part, and finally, discussion and conclusions. The introduction chapter discuss the motivations and background of this study. Then, the theoretical part describes the theoretical background used as a base for the empirical research. Theory consists of two parts: purchasing process and measurement, and e-procurement and change management. After the presentation of theory, research method and collected data are presented. In the empirical part, the case company and current practices are firstly introduced, and afterwards measurements for indirect purchasing are proposed. Then the implemented IT system is introduced and later the results of interviews are presented and analyzed. Finally, the results are discussed, the whole study is concluded, and some practical development ideas and suggestions for future research are given.

1.5 Definitions of key concepts

E-procurement means using internet technology in purchasing process. E-procurement forms can be divided into e-MRO, web-based ERP, e-sourcing, e-tendering, e-reverse auction and e-informing. (de Boer et al., 2002)

Purchase/procure-to-pay (P2P) process consists of need specification, sourcing decision, contract- or purchase-order generation, receipt of material or documents and settlement and payment. (Trkman & McCormack, 2010)

Purchasing process is the activities done in purchasing function. These activities are determining the specification of the goods and services needed, selecting the best fitting supplier, negotiating with the supplier, placing the order and then monitoring and controlling the order and lastly, evaluating the supplier. (van Weele, 2002)

Indirect procurement is obtaining of external resources, which are used in daily operations but not in the production of goods and services (Kim & Shunk, 2004). Indirect goods and services can be categorized, for example, to maintenance, repair and operating (MRO) supplies, capital equipment and services (Segev & Gebauer, 2001).

Key performance indicators (KPIs) are used to measure performance (Stricker et al., 2017). For example, KPIs measure improved quality, processes and organizational competence (Rendon, 2008).

Change management refers to planning, organizing, directing and controlling of change and in addition, there needs to be effective leadership in order to properly introduce change in an organization (Gill, 2002).

2 PURCHASING PROCESS AND MEASUREMENT

Purchasing can be defined as obtaining of goods, services, capabilities and knowledge from external sources to run, maintain and manage company's activities. (van Weele, 2002) To efficiently and systematically obtain these previously mentioned resources, purchasing has to be recognized as a strategic function (Kakouris et al., 2006). In the purchasing process, there is a high volume of information exchanged and the information needs to be analyzed before purchasing decision to ensure that the purchase fulfills the purchasing policies and the aims of the business (Chang et al., 2004). The role of purchasing process in a purchasing department is significant since it is important to manage the purchasing process which links the organization with their suppliers (Kakouris et al., 2006). Also, purchasing process is critical when managing supply chain since it directly affects to the supply chain performance of a company (Chang et al., 2004). Finally, it should be considered that successful purchasing process requires cross-functional collaboration: there should be people from different processes, such as product development and planning, involved (Chang et al., 2004).

Purchasing processes obviously differ among industries and among companies since there are different needs, organizational structures, goals etcetera. Also, inside a company, there can be several purchasing processes depending on the purchasing situation. Despite of these differences among companies, according to Scharl et al. (2001), there are at least three core phases in a business transaction: information, negotiation and settlement. In the first phase a company identifies and evaluates their needs and sources to fulfill these needs (Scharl et al., 2001). At the same time, potential sellers identify potential customers, hence this step evolves around information exchange (Scharl et al., 2001). The next phase is negotiation between customers and sellers and the goal is to jointly find possible solutions, often in the form of a contract. Lastly, the contract is achieved, and goods and payments are exchanged between customers and sellers (Scharl et al., 2001). Based on these phases, it is possible to identify similarities and differences in purchasing process models that will be introduced in the next chapter.

In this part, purchasing process will be examined and discussed in more detail by presenting the elements of purchasing process. At first different purchasing process models are presented and the stages of purchasing processes are explained furthermore to help understand the structure of purchasing. Related to purchasing process, e-procurement process is introduced. In addition, indirect procurement will be more discussed and explained since the research will be done in the context of indirect procurement. Also, the performance of purchasing process has an important role and therefore, different measurements to measure both purchasing process and e-procurement will be introduced.

2.1 Stages in purchasing process

There are plenty of purchasing process models introduced and probably one of the earliest purchasing process models has been introduced by Webster (1965) and there are four steps in the model: problem recognition, organizational assignment of buying responsibility and authority, search procedure to identify product offerings and to establish selection criteria and lastly, choosing of procedures to evaluate and select among alternatives. Samaniego et al. (2006) present a model for industrial purchasing, including the stages need recognition, technical specification, supplier search, alternative evaluation and purchase. Kakouris et al. (2006) have recognized five phases in purchasing process, which are initiation phase, planning phase, qualification phase, winning phase and monitoring and review phase. Pop Sitar (2011) has described a purchasing process consisting of exploration, discovery and exploitation of markets and organizations providing resources. Van Weele's (2014) purchasing process consists of tactical purchasing and order function. Tactical purchasing is focused on the first steps of purchasing and it includes determining specification, selecting supplier and contracting (van Weele, 2014). On the other hand, order function considers the steps after contacting, which are ordering, expediting and evaluation and follow-up and evaluation (van Weele, 2014).

Most of the purchasing process models are based on the same main elements since in most of the models, elements, such as, need identification, decision criteria, supplier selection and evaluation are included. However, it should be noticed that the most significant differences are the different point of views when it comes to the emphasizes of the models. For instance, as seen in Figure 2, van Weele's (2014) process model is quite comprehensive one since it describes the phases from determining specification to follow-up and evaluation, focusing more on buying products point of view. Compared to van Weele's model, Kakouris et al. (2006) have similar model in general, however, they are more focused on buying services. On the other hand, there are also models developed only to a specific stage of the purchasing process. For example, the model of de Boer et al. (2001) has only focused on supplier selection, consisting of problem definition, formulation of criteria, qualification and choice. Hence, compared to Kakouris et al. (2006) and van Weele (2014), de Boer's et al. (2001) model is obviously not as comprehending when trying to get a big picture of the whole purchasing process.

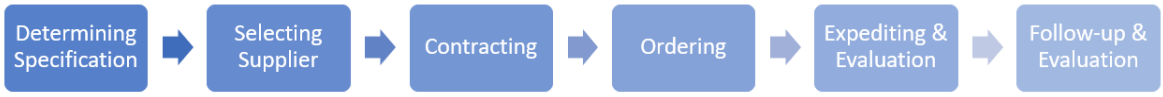

Figure 2. Purchasing process (modified from van Weele, 2014)

To start off a purchasing process, the first step is to recognize and define a need or problem (Webster, 1965; van Weele, 2002; Samaniego et al., 2006; Kakouris et al., 2006). In practice, the need is either a service or a good (Webster, 1965). In this phase, the significance of information exchange is highly important and therefore, good internal communication is needed (Kakouris et al., 2006). There should be an analysis in place to identify expected benefits, costs and risks (Kakouris et al., 2006). Then, the requirements for a product or a service are to be defined and specified, and usually there are some requirements for suppliers, which should also be taken into account at this point (van Weele, 2002). Some typical criteria include price, quality, delivery and service, to mention a few (Kakouris et al., 2006; Webster, 1965). Based on the requirements for purchased goods or services and suppliers,

the most fitting supplier is chosen, and afterwards contract can be done if desired (van Weele, 2002). The needed good or service is ordered from the chosen supplier and usually the purchasing process ends to monitoring and evaluation of the supplier (Kakouris et al., 2006).

2.2 Purchase-to-pay process

The role of P2P process in a company and its supply chain is highly important: it has been recognized that efficient P2P process is able to reduce costs, minimize inventory, increase quality and stabilize supply, to mention a few advantages (Palmer & Gupta, 2011). Naturally, also P2P processes vary among companies and industries, however, the focus of P2P process is not just purchasing department but the whole purchasing process, including other departments than procurement (Trkman & McCormack, 2010), such as operations, maintenance, administration, warehousing, logistics and accounts payable (Ash & Burn, 2006). As seen in Figure 3, Trkman and McCormack (2010) also state that P2P process consists of forecast planning and coordination, need specification, sourcing decision, contracting and purchase-order generation, receiving of materials and documents and lastly, settlement and payment. Also, Murphy (2012) has described a typical P2P process and according to the author, P2P processes consists of sending a purchase order (PO), authorizing the PO, sourcing and selecting the goods or services, generating the PO to the chosen supplier, receipt of the goods or services, receipt and authorization of the supplier invoice and finally, paying the supplier.

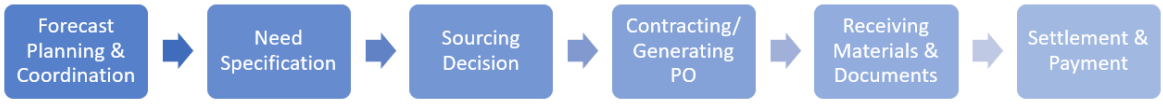

Figure 3. Purchase-to-pay process (modified from Trkman & McCormack, 2010)

A significant part of the P2P process is purchasing process which describes the tasks of purchasing department in procurement process. Therefore, usually the biggest difference between the terms P2P process and purchasing process is that purchasing process models often exclude the last step of P2P processes: payment and financial transactions. Hence, it could be said that the P2P process is a more cross-functional process since there are more people involved from different departments compared to purchasing process. In P2P process, more focus being on the financial side of supply chain management, the significance of cross-functional collaboration is important. Especially the steps receipt of the goods or services, receipt and authorization of the supplier invoice and paying the supplier, mentioned by Murphy (2012), call for financial management of supply chain.

The most recent trends and development in P2P have clearly focused on the reduction of transaction costs, which can be achieved through, for instance, automation of P2P process and e-procurement (Trkman & McCormack, 2010). However, sometimes these efforts have most impact only on the purchasing department, not on financial management of the supply chain, such as invoice processing or payment reconciliations (Dunlap, 2005). By developing and automating the whole P2P process, companies have potential to improve P2P processes, which can result in improved competitiveness and cost savings (Chang et al., 2004).

2.3 E-procurement process

As earlier introduced in the previous chapter, the amount of purchasing process models is extensive because of variety in needs in organizations. Since this research focuses on e-procurement, e-procurement procurement processes and the characteristics of e-procurement process are discussed furthermore. The purchasing process models introduced next are basically like the usual procurement process models but these models describe more in detail which kind of electronic business processes there are when purchasing by using e-procurement systems.

According to Chang et al. (2004), a procurement process in e-procurement consists of material sourcing and procurement execution. Underneath material sourcing, there are six steps: collection of supply requirements, collection of product and vendor information, preparation of the request for quotation (RFQ), publishing of the RFQ to the open market or a pre-selected supplier group, collection of supplier quotations and quotation evaluation and selection. In collection of supply requirements, information is in different data formats, in different system and can be geographically distributed. Often these requirements are designed to satisfy the needs of production. Also, product and vendor information can be found in different forms and systems. Often RFQs are made to plan supplies of the buying company in order to satisfy production requirements. RFQ means usually a document which forms the purchasing requirements and conditions, and the document can be a simple form or a more complex with detailed specifications and purchasing terms. A prepared RFQ is communicated to the company's supply base by either posting, faxing or e-mailing it and afterwards, the quotations from suppliers are taken. Lastly, the quotations must be evaluated by using the earlier defined criteria, such as delivery time, cost, vendor reliability and quality. It is possible that there are negotiations between the buying company and suppliers, which requires modifying the RFQ and repeating the steps after preparation of the RFQ until there is an agreement between the parties. (Chang et al., 2004)

The second part of e-procurement process, procurement execution, includes generation and execution of a purchase-order and product receipt and payment. The purchasing order (PO) is created after the best quote has been selected and often, PO is generated by using the company's ERP system and the information got from the quotation. The final step of the procurement process is receiving and paying the PO. Received products are compared to the PO and if the agreed conditions are met, the invoice is audited and then paid to the supplier. Usually delivery conditions are recorded for future reference to evaluate the supplier, especially the information regarding on-time delivery and quality. (Chang et al., 2004)

Kim and Shunk (2004) present in their study both high-level process and low-level process to describe e-procurement process of indirect procurement. High-level buying processes are the main phases and low-level processes describe the main phases in more detailed level. The high-level processes are information phase, negotiation for off-contracted buying if required, settlement and after-sales. Information phase consists of pre-contracted item search, off-contracted item search, item selection, purchase requisition and requisition approval if needed. Negotiation for off-contracted buying includes sell-side catalogue, auction, group buying, negotiation, exchange, reverse auction, bid and offer-to-buy posting. In settlement, there are PO generation, PO placement, order tracking and receiving, invoicing and payment needed. Lastly, there is after-sales in which transaction analysis is needed. It is important to notice that these low-level processes can all be performed by utilizing e-procurement systems. On the other hand, as seen in Figure 4, Kothari et al. (2005) describe procurement process in e-procurement consisting of order request, approval, approved purchase order, order status and tracking information. E-procurement allows to store contract prices in organization's internal database or electronic catalogue, which makes possible for the final buyer to compare different alternatives (Kothari et al., 2005).

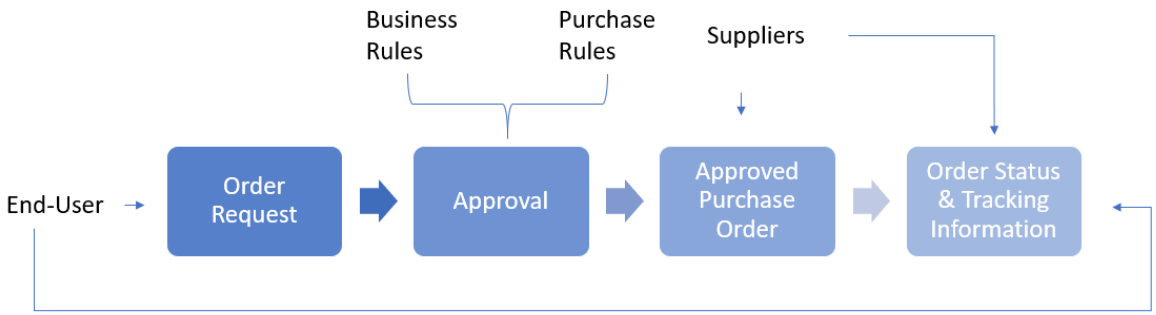

Figure 4. E-procurement process (modified from Kothari et al., 2005)

2.4 Indirect procurement

As earlier discovered, the attention and efforts have been focused mostly on direct purchasing instead of indirect purchasing due to managers' assumption of indirect purchasing being less critical to manufacturing. However, the total purchasing expenditure for indirect purchasing in large companies is usually fairly over 30 percent of their revenues and therefore, if not given enough attention to indirect purchasing, companies can lose the potential to savings and to add value. (de Boer et al., 2003) Since there are lots of variety in indirect goods and services, from standardized low value goods to complex and costly products and services, organizations can categorize indirect items in many ways according to their business (Segev & Gebauer, 2001). When it comes to supplier relationships in indirect procurement, there are several types of relationships: partnerships, strategic alliances, comparative buying from certain suppliers or ad-hoc buying (Segev & Gebauer, 2001).

Typically, there is no general purchasing departments covering all indirect purchases since that would require excessive amounts of organizational resources and cause significant inefficiencies (de Boer et al., 2003). Procurement of indirect products and services is not usually strictly scheduled and quite often everyone in the company can make purchases, although those purchases typically must be approved (Gebauer & Segev, 2000). Often the order sizes of indirect purchasing are smaller, and the end-user of the product or service is referred as an internal customer (Hawking et al., 2004). The most important advantages of involving purchasing more in indirect procurement are clear: cost savings, better service and quality, lower product or service cycle time, increased process efficiency, increased compliance in contracts, better control over costs, legal protection and improved supplier relationships (de Boer et al., 2003). In addition, indirect purchasing can add value to by arranging and managing contracts with suppliers and by bundling demand coming from multiple internal customers (de Boer et al., 2003).

Due to complex nature of purchased items and services, there are some significant challenges related to indirect procurement and organizing it. Compared to direct procurement activities, in indirect procurement the demand for goods and services can be nearly impossible to predict. Also, often it is not just the personnel from the purchasing department who purchases indirect goods and services but these employees from all other functions may not be very familiar with purchasing. (Gebauer & Segev, 2000) This makes organization of indirect purchasing quite complex, especially if there are no buying policies for employees or if the buying policies are not followed (Weeme, 2003). Often there is less data available from indirect purchasing and in addition, there might not be enough resources to control spending (de Boer et al., 2003), which makes the monitoring of indirect buying even more difficult.

To reorganize and rationalize indirect purchasing, there are some solutions that could be taken. The first one is implementation of e-procurement system, which drives improvements in, for instance, savings and company performance (Weeme, 2003). Another solution could be involving of top management to provide clear and credible corporate framework, such as rules, to organize indirect purchasing (de Boer et al., 2003). Also, one possibility is to make effort to increase contracted buying through multi-vendor catalogues which include pre-contracted items to reduce maverick-buying, for example (Gebauer & Segev, 2000). Maverick-buying refers to making purchasing but not using formally defined processes (Angeles & Navi, 2007). Further, contracted buying allows the utilization of corporate purchasing power which results in savings. In addition, because indirect buying is not often well enough documented, there can be lack of transparency in the buying process and therefore, monitoring of spending patterns is nearly impossible (Gebauer & Segev, 2000). Hence, better information could be obtained by using e-procurement systems (Weeme, 2003). Finally, indirect procurement often suffers from massive supplier base, therefore, it could be beneficial to increase the level of cooperation with a limited number of preferred suppliers (Gebauer & Segev, 2000).

2.4.1 Category management for indirect procurement

A purchasing category is a group of products or services which are procured from the supply market and are used to produce goods and services or used in non-production related operations (van Weele, 2014). There are various ways to categorize different supply sources and the categories mostly depend on the company itself and its business and core activities. According to van Weele (2014), the categories for non-production related purchasing spend, based on the characters of purchased goods and services, are information technology, marketing and communication, professional services, human resource management, facility management, transport and logistics, and technical maintenance. These categories include various amount of more specific sub categories (van Weele, 2014).

Due to high variety of among indirect goods and services, distinct plans and strategies to manage the different categories can be helpful (Padhi et al., 2012). Probably of the most known category management tool to develop sourcing categories is Purchasing Portfolio Analysis developed by Kraljic (1983). The matrix helps to find out the best sourcing strategy for a specific purchased product or service by categorizing them into four categories based on the importance of the purchased item and the complexity of the supply: bottleneck items, non-critical items, leverage items and strategic items (Kraljic, 1983). For bottleneck items securing supply and searching for alternative supplier is recommended (Gangurde & Chavan, 2016). The order volumes of non-critical items should be optimized as well as paying attention to efficient processing (Kraljic, 1983). In leverage items, the full purchasing power should be used, and purchasing prices should be negotiated (Kraljic, 1983). Finally, in strategic items, there can be a lack of availability and therefore, it is recommended to invest on the relationship with a supplier and try to develop a long-term partnership (Gangurde & Chavan, 2016). Many of the later developed portfolio models are based on Kraljic's (1983) model, such as the portfolio model of supplier relationships by Olsen and Ellram (1997) or the classification and position of commodities by Padhi et al. (2012). However, there are

some important critique presented towards the purchasing portfolio approaches since, for instance, these models do not take into account the suppliers' side in the relationship or the models do not explain how the dimensions should be measured in practice (Gelderman & van Weele, 2003).

In addition to purchasing portfolio models, there are some other basic strategies that could be used when developing purchasing strategies for different categories. In the research of Ateş et al. (2015), the authors have used cost strategies and innovation strategies as purchasing category strategies. The main focus of cost strategies is to reduce the unit prices of purchased products and services, decrease total cost of ownership, increase efficiency, and lastly, improve the utilization of assets (Ateş et al., 2018). On the other hand, innovation strategies are used to enhance the introduction rates and timing of new services and products and, in addition, boost higher quality, specifications and functionality (Ateş et al., 2018). Hadeler and Evans (1994) have developed a framework called the Supply Strategy Square which can be used to find to an appropriated sourcing strategy for each category. There are four types of strategies: simple contacts, global trading, close relationships and strategic partnerships (Hadeler & Evans, 1994). The strategy choice is based on a checklist which categorizes items depending the complexity of the purchase and the value potential (Hadeler & Evans, 1994).

2.5 Purchasing performance and measurement

Purchasing performance has a significant role in determining of competitive advantage in companies (Nair et al., 2015) and therefore, purchasing performance is an important element of corporate performance. Performance measurement is meant to indicate if organizations are going towards the goals and objectives they have (Ishaq Bhatti et al., 2014). Furthermore, purchasing performance is clearly related to the strategic perspectives of companies, such as quality, cost and flexibility (Nair et al., 2015). According to Förstl et al. (2013), management of performance allows to detect inadequate performance and makes the value

contribution of a function more transparent to other functions. Also, the same authors state that supply base management and category management efforts should be coordinated in order to achieve improved levels of firm and purchasing performance.

The linkage between strategic purchasing and purchasing performance should not be ignored since purchasing activities should be based on strategies and therefore, purchasing activities should be measured to ensure compliance with the strategies. (Carr & Pearson, 2002) When it comes to linking purchasing and business goals, Pohl and Förstl (2011) emphasize the importance of internal fit, also known as strategic fit, which means strategic integration and alignment between purchasing function and overall corporate goals. This fit can be described as the connection between purchasing performance and business strategy (González-Benito, 2007). In practice, the strategic direction should be carefully considered, which usually means integrating the head of purchasing into top management strategic planning (Baier et al., 2008). In addition, the most competitive dimensions of purchasing, which are able to provide the best value to purchasing, should be prioritized (Baier et al., 2008).

When it comes to specifically measuring e-procurement performance, according to Panda and Sahu (2012), there are five supporting factors: understanding the objectives and goals, measuring performance against the objectives and goals, identifying performance indicators, aligning rewards with performance assessment and lastly, encouraging the stakeholders to increase overall performance. The two main indicator groups, according to Ishaq Bhatti et al. (2014) are financial or cost-based indicators and non-financial or non-cost-based measures. On the other hand, Kern et al. (2011) have divided purchasing performance measures into financial and operational measures. Easton et al. (2002) have earlier mentioned that traditionally purchasing performance has been measured by costs and profits. However, these measures have been largely criticized, and even considered to be outdated, since they promoted short-term benefits instead of long-term profits and they encouraged

managers to only increase the performance of their own department while damaging the performance of other departments (Easton et al., 2002). Regardless the critique provided towards traditional measurements, expenses are still one of the dominant performance measurements in procurement (Caniato et al., 2014).

2.6 KPIs in e-purchasing performance

To identify performance gaps between current and desired performance and in addition, to show the progress towards closing the gaps, there must be well-defined performance indicators in place. Performance indicators help managers to focus resources to the areas that impact performance. (Muchiri et al., 2010) Also, performance measurement supports decision-making processes, helps with communication in purchasing organization, motivates people and makes possible to benchmark to other companies (Caniato et al., 2014). In addition, measures promote communication with external stakeholders who may not be familiar with the processes and operations of the company (Melnyk et al., 2004). According to Kaskinen (2007), companies can especially benefit from measuring purchasing process related KPIs since KPIs provide insights into spend and cash flow management. Furthermore, measuring KPIs allows companies continuously improve and decrease operating costs (Kaskinen, 2007). However, although measuring of purchasing performance is highly needed (Meekings, 2005), it should be taken into account that measuring of purchasing performance and then comparing the performance to other purchasing departments can be remarkably challenging due to the lack of valid measurement criteria and absence of a single index of overall performance (Easton et al., 2002).

If a company has not had an established KPI program before in P2P, Kaskinen (2007) proposes following the following seven steps: set program goals, select balanced actionable KPIs, align your KPIs with your strategy, establish benchmarks, determine your baseline, determine what you need to view and establish reporting needs. Naturally, the first step is to understand, what are the wanted goals that are

tried to be achieved by measuring. It is possible to measure plenty of metrics but in practice, it is not beneficial to try to focus on all the metrics at the same time and therefore, prioritization is needed. Involving the people responsible for KPIs is important in order to find out what is current lacking or effectively working in the process. The selected KPIs should provide meaningful information-based on needs. (Kaskinen, 2007)

The next step, selecting of KPIs, is essential to comprehensively measure system since there needs to be multiple KPIs to effective measurement. Usually one of the main challenges of KPIs is to determine the KPIs which are relevant for the specific performance measurement. (Stricker et al., 2017) Then, KPIs should be aligned with a company's strategy and business goals, which means determining of the relevant KPIs that have the greatest impact on the company (Kaskinen, 2007). However, it should be noted that since there are differences between direct and indirect purchasing strategies, it is highly possible that different sets of KPIs are emphasized according to the type of purchasing (Caniato et al., 2014). Also, companies should be careful with traditional performance measurements, which are based on financial data (Ghalayini & Noble, 1996), because they have been criticized since the measures can be inflexible, there might not be strategic focus on them or they can be even invalid (Easton et al., 2002).

There should be benchmarks determined for each KPI. These can be either external, such as industry standards, or internal benchmarks, for example internal goals. Then, the current state of each indicator should be identified in order to actually be able to track change easily since there is something to compare to. Also, this helps to see early warnings signs and hence, mitigate risks. Establishing a dashboard helps to visualize and display the information and see if the goals are achieved. Good dashboards provide key information for all stakeholders immediately and allow to make root cause analyzes. (Kaskinen, 2007)

Lastly, since there are different reporting needs inside organizations, it is desirable to communicate specific, tailored KPI sets for different stakeholders. (Kaskinen, 2007) According to Chao et al. (1993), another important issue to notice is that all measurements are not equal: depending on the role of person, the importance of a measure can vary a lot. For example, managers, buyers and internal customers all have different perspectives on the importance of measurements. Also, Caniato et al. (2014) points out that there are differences in the frequency of measuring and reporting of KPIs depending on the nature of a specific KPI. For instance, economic measures, usually related to the accounting cycle, are often analyzed only once or twice a year although information regarding to them is collected more frequently (Caniato et al., 2014). However, public companies often require measuring once a month, as well as the performance of suppliers is typically followed monthly, if possible (Caniato et al., 2014). Information systems are considered to be the most restrictive factor when it comes to the frequency of measuring and therefore, they can significantly constrain data availability, which can lead less optimal frequencies (Caniato et al., 2014).

As earlier mentioned, procurement performance can be divided into strategic and operational dimensions. Strategic measures are useful for providing measures in terms of strategic sourcing decisions and supplier relationships (Khan & Pillania, 2008). Operational purchasing performance includes measures, which are mainly related to the quality of purchased items or services, on-time delivery, costs of materials, level of inventory goals (Sánchez-Rodríguez et al., 2004) and satisfaction of internal customers (Sánchez-Rodríguez, 2009). Furthermore, another common way to categorize purchasing related measures is to divide them into financial and non-financial measurements. Financial measures are especially suitable for strategic decisions and providing external reporting (Gunasekaran et al., 2001). On the other hand, non-financial performance measures, such as quality or satisfaction related metrics, are increasingly employed and when they are used, the measures are considered to be important for companies (Abdel-Maksoud et al., 2005).

Abolbashari et al. (2018) have identified in their study a large amount of KPIs related to purchasing performance. The final set of procurement KPIs includes procurement cycle time, cost, value for money, e-procurement, customer satisfaction, quality, supplier performance, forecasting accuracy, effectiveness, efficiency and buyer's state. Hemsworth et al. (2005) use in their study actual compared to target cost of materials, quality, on-time delivery and level of achieving inventory goals to measure purchasing performance. Nollet et al. (2017) use in their study four purchasing performance measures: total number of PO, number of active products in the database, total cost for the PO, savings generated at the signature of a contract. Koubaa (2016) presents different metrics to measure purchasing performance, including on-time delivery, procurement conformity, purchase requisition activity, various purchase requisition metrics, supplier portfolio optimization, procurement conformity rating, supplier cost reduction and force proposal, customer satisfaction rate and cost savings.

In this study, the measurements related to purchasing performance and e-procurement are divided into strategic, tactical and operational level metrics, as presented in Table 1. The levels can be connected to top management, middle management and operating management. (Irani & Love, 2002) This classification implies that top management is the most responsible for strategic level, middle management for tactical level and operating management for operational level. By using this classification, finding of the most suitable management level for measurements is supported, which helps dealing with indicators (Gunasekaran et al., 2001). Also, it is useful to measure all these levels since they are all needed to fulfill the ultimate goals and targets of the company and therefore, any of them cannot be neglect.

Table 1. Purchasing performance measurements

	Measurement	Example Reference
Strategic	Information sharing with suppliers	Tai et al. (2010)
	Collaborative activities with suppliers	Tai et al. (2010)
	Supplier performance evaluation	Pohl & Förstl (2011)
Tactical	Total cost of purchase	Caniato et al. (2014)
	Cost per invoice	Chomchaiya & Esichaikul (2016)
	Contract coverage percentage	Pohl & Förstl (2011)
	Amount of qualified supplier who meet defined requirements	Chomchaiya & Esichaikul (2016)
	Maverick-buying ratio	Pohl & Förstl (2011)
	Number of active suppliers	Pohl & Förstl (2011)
	Efficiency of IT system	Kumar et al. (2005)
	Labour cost savings	Chomchaiya & Esichaikul (2016)
	Purchasing price	Caniato et al. (2014)
	Source identification, qualification and selection cycle time	Chomchaiya & Esichaikul (2016)
	Real-time spending compared with budget	Toktaş-Palut et al. (2014)
Operational	Average time of processing a purchasing request	Pohl & Förstl (2011)
	Payment term compliance	Caniato et al. (2014)
	The number of erros made in e.g. specifications, quantity and price	Chao et al. (1993)
	Total throughput time	Caniato et al. (2014)
	Amount of delays in the processing of payments	Saad et al. (2016)

2.6.1 Strategic measurements

Strategic measurements are the highest-level metrics in companies and they are needed to assess strategic performance (Rotchanakitumnuai, 2013). Strategic performance is closely linked to strategic goals, which can be related to, for example, improving customer satisfaction or increasing competitive advantage by focusing on buying company's bargaining power (Tai et al., 2010). Strategic level measures can be harder to measure with financial or tangible measures since they are often more non-financial and intangible in their nature (Piotrowicz & Irani, 2010). For example, information sharing with suppliers can be defined as the extent information sharing is enhanced between the company and its suppliers (Tai et al., 2010) and it measures the relationship with the supplier but in reality, this kind of measurement can be hard to determine and follow precisely. Also, collaborative activities with suppliers have been mentioned, referring to the extent the company has collaborative activities with suppliers (Tai et al., 2010).

Supplier performance evaluation can be measured in many ways, for instance, in terms of delivery, quality, cost and flexibility. Delivery is often measured as on-time

delivery rate, such as number of late deliveries (Pohl & Förstl, 2011). Quality refers to the quality of supplied goods or services and it is possible to measure quality improvement (Pohl & Förstl, 2011), customer satisfaction, order fill rate or product and services availability (Piotrowicz & Cuthbertson, 2015). Costs are a very common way to measure suppliers. For example, the amount of generated savings could be measured or total cost of ownership for a purchasing project (Pohl & Förstl, 2011). Flexibility means changes in the product and the volume (Wheelwright, 1978). However, flexibility has not been recognized as important factor in the context of indirect purchasing compared to direct purchasing (Pohl & Förstl, 2011). Suppliers' performance can be compared to the performance of spot market (Pohl & Förstl, 2011).

2.6.2 Tactical measurements

Tactical level purchasing activities are mid-term period activities (Gunasekaran et al., 2008). Efficiency at tactical level consists of cost of purchases, which includes total annual cost reductions and potential cost reductions (Dumond, 1994). Also, total cost of purchase, purchasing price (Caniato et al., 2014) and cost per invoice (Chomchaiya & Esichaikul, 2016) measure the savings achieved from suppliers and these kinds of measurements are very common in companies. Cost savings can be measured as labor cost savings, which can potentially improve efficiency (Chomchaiya & Esichaikul, 2016). Lastly, one way to measure costs is to compare real-time spending with the budget, which enables continuous control (Toktaş-Palut et al., 2014). On the other hand, there are indicators to measure efficiency of an IT system, for instance, this could be calculated as the number of electronic items requisition forms divided by the number of employees handling the system (Kumar et al., 2005).

Transparency aspect of purchasing process is possible to measure, for instance, using the percentage of qualified suppliers who meet defined requirements. By measuring of transparency, it is easier to control fairness and competitiveness of

bidding. (Chomchaiya & Esichaikul, 2016) Also, transparency decreases time needed for evaluation and making decisions and therefore, results as time saving in the overall purchasing process (Toktaş-Palut et al., 2014), including source identification, qualification and selection time cycles (Chomchaiya & Esichaikul, 2016). Maverick-buying, which is probably one of the most interesting measurements when it comes to indirect purchasing, can be calculated as the percentages of purchases without company contracts (de Boer et al., 2002). On the other hand, contract coverage percentage measures the percentage of used frame agreements (Pohl & Förstl, 2011). In addition, as the current trend is to decrease the number of suppliers, number of active suppliers supports this goal (Pohl & Förstl, 2011).

2.6.3 Operational measurements

Operational indicators measure the operational level of a company and therefore, these indicators measure the operational improvement of technology implementation (Mukhopadhyay & Kekre, 2002). These measures include, for example, operating costs and order processing time related indicators (Dumond, 1994). Efficiency related measurements can be measured at operational level, too, and therefore, efficiency could be defined as the number of resources needed to produce a unit of output since it indicates the usage of resources in a process (Gardenal, 2013). In longer time horizon, the progress in operational indicators can lead to improvements in strategic measurements (Mukhopadhyay & Kekre, 2002).

Time performance of internal processes is important to measure since it is related to, for instance, efficiency of companies. Possible measurements can be indicators, such as, as order cycle time or total lead time from request for PO to PO fulfillment (Caniato et al., 2014). PO cycle time is especially important for internal customers since these issuance times are usually concerning them (Chao et al., 1993). If a company is able to reduce the order cycle lead times, the company is able to reduce the supply chain response time, which can create again improved competitive

advantage (Gunasekaran et al., 2001). In addition, processing time of invoices critically impacts on payment term compliance (Caniato et al., 2014) and the amount of delays in the processing of payments since high cycle times can cause financial problems in budget approval and payments (Chomchaiya & Esichaikul, 2016).

Finally, when it comes to measuring tracking and tracing, on-time-delivery could be as the percentage of on-time delivery to the buyer (Abdel-Maksoud et al., 2005). By this way it is possible to find out the number of batches which have been delivered on time. Another option is to calculate the number of delays and, obviously, the bigger the number, the greater the negative impact is on the buyer's competitiveness (Koubaa, 2016). On the other hand, calculating the number of errors or failures occurred in purchasing, for instance, in need specification, quantity, price or due date can support in measuring of accuracy (Chao et al., 1993).

2.6.4 Category performance measurement

It is quite common to measure the performance of purchasing department as the performance of the whole purchasing function. However, one possible way to improve the performance of a specific purchasing category is to determine measurements according to the category characteristics since due to unique characteristics of each category, it can be helpful to see the numbers for the specific category. Some measurements which may be relevant for some categories, may not be as suitable for some other categories. For example, when comparing purchasing of engineering or consulting services and purchasing of office supplies, it is easy to understand that there are differences.

In some categories, such as maintenance, repair and operations (MRO), purchasing performance can be measured by using two dimensions: direct product costs and acquisition costs. Direct costs refer to the actual price which is charged by the supplier. On the other hand, acquisition costs are the costs related to ordering,

delivering, warehousing and monitoring of supplier performance and communicating with suppliers. In practice, purchasing performance could be measured as the reduction of purchasing price, such as perceived price reduction and percentage of price reduction, and purchasing efficiency, such as searching time, ordering time, number of employees and amount of work saved. These measurements could be used to especially measure the impact of moving into the e-procurement environment. (Kwon et al., 2009)

Despite of the challenges to develop universal measurements for indirect categories, Kauppi et al. (2013) have developed four universal performance measures to measure category performance: purchasing price, purchasing process costs, contract compliance and user satisfaction. By purchasing price, it is meant direct and indirect costs of purchased products and services (de Boer et al., 2002). Purchasing process costs refer to the work related to processing of POs (Kauppi et al., 2013), from the cost of searching and selecting supplier to invoicing and payment (de Boer et al., 2002). Contract compliance refers to the extent in which users comply with agreed contracts (Karjalainen et al., 2009). Finally, user satisfaction can be defined as an internal user's perception about the quality of an e-procurement system (Brandon-Jones & Carey, 2011).

3 E-PROCUREMENT AND CHANGE MANAGEMENT

This part focuses on e-procurement, e-procurement systems and how those systems can be implemented successfully into organizations. Firstly, different kinds of e-procurement systems are introduced. Procurement and selection criteria for IT systems and the process of obtaining an e-procurement system are also explained. Lastly, since implementation of an e-procurement system is one of the most crucial elements when it comes to the empirical part of this research, therefore, the benefits, barriers and success factors of e-procurement implementation are discussed in more detail. Also, as earlier mentioned, the focus of the research is in indirect procurement, and therefore, this chapter focuses on the indirect procurement point of view, and how e-procurement systems can provide solutions to solve challenges related to indirect procurement.

The main business process related to e-procurement is the P2P process and therefore, e-procurement deals with the whole purchasing process (Trkman & McCormack, 2010). In e-procurement, the purchasing process is automated and integrated with other functions and the data can be shared among the members of the supply chain (Bottani & Rizzi, 2005). According to Dai et al. (2005), there are three IT infrastructure components that are needed in the adoption of electronic purchasing: network or server, software and designing or redesigning of the business process of the company. Redesigning of business process is especially important because usually there is a change from a negotiation centered to a preparation centered process (Dai et al., 2005). However, it should be noticed that maximizing e-procurement benefits does not equal to performing everything online (Gardenal, 2013). Also, e-procurement is not just one application but includes several different tools (Knudsen, 2003). Lastly, one e-procurement strategy might not be enough to successful implementation of e-procurement and hence, identifying of different e-procurement strategy for each category might be useful (Puschmann & Alt, 2005).

3.1 E-procurement systems

The main functionalities of e-procurement systems consist of workflow, system integration, catalogues, repository and content management, RFX, order placement, order tracking and tracing, e-invoicing and reporting (Caniato et al., 2012). In addition to those, Benslimane et al. (2007) add shopping carts and payment systems. However, there are many types of e-procurement systems and they can be divided into different categories based on the needs of a company (Dai & Kauffman, 2006) and therefore, there is no one universal way to classify e-procurement systems in earlier literature (Oh et al., 2014). De Boer et al. (2001) have identified six forms, in which e-procurement applications can be categorized: e-sourcing, e-tendering, e-informing, e-reverse auctions, e-MRO and web-based ERP systems. Similarly, Kauppi et al. (2013) have classified e-purchasing tools into: e-sourcing tools, e-process tools and e-transaction tools. On the other hand, Dai and Kauffman's (2006) have categorized e-procurement systems into extranets and e-markets. In this study, the focus will be on web-based e-MRO systems.

By e-sourcing, it is meant finding new potential suppliers by using internet technology, which allows to increase competition in the tendering process for a specific purchasing category. In addition, e-sourcing can be used to decrease supply risk within a specific purchasing category. In e-tendering, requests for information and prices are sent using internet technology, and also the responses from suppliers are received via internet. E-tendering process can include the analysis and comparison of suppliers' responses but not closing the deal. E-informing, on the other hand, is the process of collecting and distributing purchasing related information between internal and external parties through the usage of internet technology. In e-reverse auctions, the most important criterion is price and reverse auctions enable buying of goods and services from multiple known or unknown suppliers. Lastly, e-MRO and web-based ERP are related to creating and approving of requisitions, sending purchase orders and receiving goods and services, by using internet technology-based software. The difference between e-MRO and ERP is that MRO goods and services are non-production related but in

the case of ERP, the goods and services are production-related. The supporting software system used for MRO is usually used by all employees of a company, but ERP is mostly only used by the people of the purchasing function. (de Boer et al., 2001) In addition, to the model of de Boer et al. (2001), Knudsen (2003) adds one more application, e-collaboration, which refers to correcting and updating the data related to products, blueprints and sales forecasts and allowing continuous access to the data via the company's web site or extranet.

Furthermore, Dai and Kauffman's (2006) two channels recognized for e-procurement are extranets and e-markets. Extranets are described as private networks which are only open to some pre-selected business partners (Dai & Kauffman, 2006). Therefore, extranets can used to share both transactional and strategic information (Dai & Kauffman, 2006), which makes them suitable to be used with suppliers to share information about, for example, products, prices and sales (Oh et al., 2014). Hence, extranets are potential to improve collaboration in supply chain networks (Oh et al., 2014). However, there can be higher costs to add participants into extranet and also, closed network only allows a restricted access to suppliers (Dai & Kauffman, 2006). E-markets, on the other hand, are open networks which can be accessed by many potential business partners (Dai & Kauffman, 2006) and hence, these systems are more suitable for finding and contacting potential suppliers (Oh et al., 2014). However, due to openness, strategic information is not shared in e-markets (Dai & Kauffman, 2006) and therefore, it is crucial to increase the collaboration capability to build relationships (Oh et al., 2014).

According to Chang et al. (2004), there are three tiers used in designing of procurement platform: database tier, application tier and presentation tier. In database tier, a standard relational database management system is accessed and used by using Java Database Connectivity. The database is able to fit high volumes of data, which consists mainly from the supplier catalogues. Application server tier is the purchasing application logic and it supports procurement related decisions by using the data from the database, in addition, this tier is responsible to track and

execute transaction and manage workflow. The data is gathered from enterprise resource planning (ERP) and other systems. The last tier, presentation tier, uses a web server to provide an access to the information of the software through a web browser. (Chang et al., 2004)

3.1.1 Mobile procurement

Nowadays, the importance of mobile phones and therefore, the number of mobile applications is still further increasing. Mobile applications have already had a great impact on business and there are some system providers who are offering mobile access to their e-procurement system, however, there are still lots of unused potential that could profit companies. Although e-commerce and mobile business are closely related to each other, there are some significant fundamental differences between them (Picoto et al., 2014). Basically, mobile business applications are information and communication systems which can be described as functional, portable and usable (Gebauer & Shaw, 2004). Functionality refers to the possibility to combine traditional communication systems with data-processing and information systems, portability means the portability of devices and lastly, usability considers the perspective of the user when it comes to system performance and user support (Gebauer & Shaw, 2004). In procurement, mobile applications often enhance an existing e-procurement software and usually these applications are used to create purchase requisitions, approve requisitions and then review the status of requisitions (Puschmann & Alt, 2005).

In addition to the characteristics mentioned earlier, the advantages of mobile technologies include flexibility, allowing user identification through, for instance, SIM card, localization, offering instant connectivity (Picoto et al., 2014) and support for simple activities, such as tracking requisitions (Puschmann & Alt, 2005). The portability of the devices using mobile technology offers flexibility in location and time compared to physical marketplaces or fixed electronic channels (Picoto et al., 2014). Localization makes it possible to identify the geographic location in which the

user is (Picoto et al., 2014). Instant connectivity allows to be reachable and have access anywhere and anytime (Picoto et al., 2014; Puschmann & Alt, 2005).

Although mobile business applications have become more and more popular, there are still some problems related to them, which should be taken into account. Since the whole existence of mobile applications is based on flexibility and easiness to use, there is a great barrier for potential users to use the application if the new technology is not easy to use, especially for more aged people (Gurtner et al., 2014). Usable interface makes using a lot more convenient, however, designing good user interface for mobile applications is challenging since there are diversity in the sizes of mobile front-ends and mobile devices (Legner et al., 2016). In addition, there can be restrictions in an individual device's properties, such as memory capacity, battery lifetime and processing power (Legner et al., 2016), which can significantly impact on the usability of the mobile application.

3.2 Selection of an e-procurement system

The design of e-procurement is an important factor when considering buying an e-procurement system. According to Chang et al. (2004), there are both functional and technical requirements for e-procurement systems. On the other hand, Benslimane et al. (2007), have divided requirements for functional and non-functional requirements. Oh et al. (2013) propose two main capabilities: collaboration and dynamic. Furthermore, according to Kaskinen (2007), the system should also be able to support selected KPIs. For example, external data should be easily integrated into the system and there must be flexibility to compare different units against the defined targets and reports (Kaskinen, 2007).

Functional requirements are the expected services which are provided by an IT system and non-functional requirements are more related to quality features, such as reliability, security or usability, of these systems. Basically, non-functional

requirements define how e-procurement systems perform the needed functional requirements. (Benslimane et al., 2007) On the other hand, according to Oh et al. (2013), since there is need to collaborate with suppliers outside the company, called as external collaboration, as well as need to cooperate within the company, known as internal collaboration, collaboration capability is crucial in e-procurement systems. In external collaboration an IT system is needed to build and create close relationships and on the other hand, internal collaboration means the extent to which there is collaboration between internal departments and employees by using IT (Oh et al., 2013). When it comes to dynamic capability, it can be divided into two dimensions: market adoption and operational flexibility (Oh et al., 2013). Market adoption means that there should be an ability to make quick changes in the market by using an IT system and operational flexibility refers to the capability to use diverse IT tools and develop IT (Oh et al., 2013).

According to Chang et al. (2004), an IT system should comply with functional and technical requirements which emerge from the procurement process. For example, there are supply requirements, cross-referencing of item codes and catalogue management (Chang et al., 2004). Especially in some indirect procurement categories, such as in packaging and labels or hand tools, catalogues can be an efficient way to organize the items in the procurement system (Baron et al., 2000). Catalogues may contain images, text, technical drawings or even videos (Chang et al., 2004). According to Kim and Shunk (2004), there are at least three types to manage e-catalogues: internal multi-vendor catalogues, punch-out catalogues and third-party catalogues. Multi-vendor catalogues are directly integrated into the buyer's e-procurement system but there are no common standards for taxonomy in catalogues and there is continuous need to update the latest data (Kim & Shunk, 2004). Punch-out catalogues are hosted by suppliers and usually there is an access into punch-out catalogues through the buyer's e-procurement system, however, it is harder to compare items (Kim & Shunk, 2004). Third-party catalogues are enormous catalogues, which bring buyers and sellers together allowing them to negotiate prices in electronic marketplaces (Kim & Shunk, 2004), however, as Dai and

Kauffman (2006) notice, information sharing is lower between the parties in this type.

Another feature that should be in the system, is the possibility to have reporting and analyzing features for the data in the system. By using the data, organizations are able to analyze for example spending behavior. (Ronchi et al., 2010) In addition to, it is important to thoroughly examine the provider of the system itself and which kind of role the system provider has (Ronchi et al., 2010) since the risks of a provider are vital to explore before the decision of the provider is made (Ramkumar, 2016). Obviously, the provider that meets the needs best, should be chosen because then there is less need for modifications (Onut & Efendigil, 2010). Some of the issues to consider are, for example, the time the supplier has been in the market, the supplier's main business focus (Kite & Fletcher-MacDonald, 1999), vendor support including technical assistance, emergency maintenance, updates and user training (Onut & Efendigil, 2010).

When it comes to P2P systems particularly in indirect procurement, it is highly important to notice that not only traditional purchasing process is crucial for the P2P process but also the tasks related to order-to-cash processes, such as payment, invoicing, approval and reconciliation (Dunlap, 2005). This means that these order-to-cash processes need to be especially considered when selecting the e-procurement system for a company. Also, it should be noticed that most resource planning systems aimed for direct purchasing are not addressing well enough the requirements of non-production purchases (Michaelides et al., 2003). As earlier mentioned, systems that can be used in P2P processes in indirect purchasing are usually end-to-end web-based solutions (de Boer et al., 2002), which should be possible to integrate with the existing back-end systems of the company, such as other procurement related systems (Chang et al., 2004). Some other features that P2P systems could include are competitive tendering, ordering, logistics, receiving and payment (Ash & Burn, 2006).

3.3 Importance and benefits of e-procurement

Compared traditional purchasing cycle to e-procurement purchasing cycle, as illustrated in Figure 5, there are less steps in e-procurement purchasing cycle. The main differences between the two cycles are that in the e-procurement one, there is no need to manually send requisitions or match invoices to receipts since all manual work is minimized. (van Weele, 2002) By eliminating manual work, there is, for instance, less need for human processing and therefore less errors (Ash & Burn, 2006). Therefore, one of the main goals of e-procurement systems is to make procurement more efficient (Wu et al., 2007). Also, e-procurement has a positive impact on an organization's financial, operational and supply chain performance (Kim et al., 2015). Kim et al. (2015) notice that e-procurement is also capable to increase efficiency of strategic sourcing since it makes possible to purchasing function to focus on strategic sourcing.

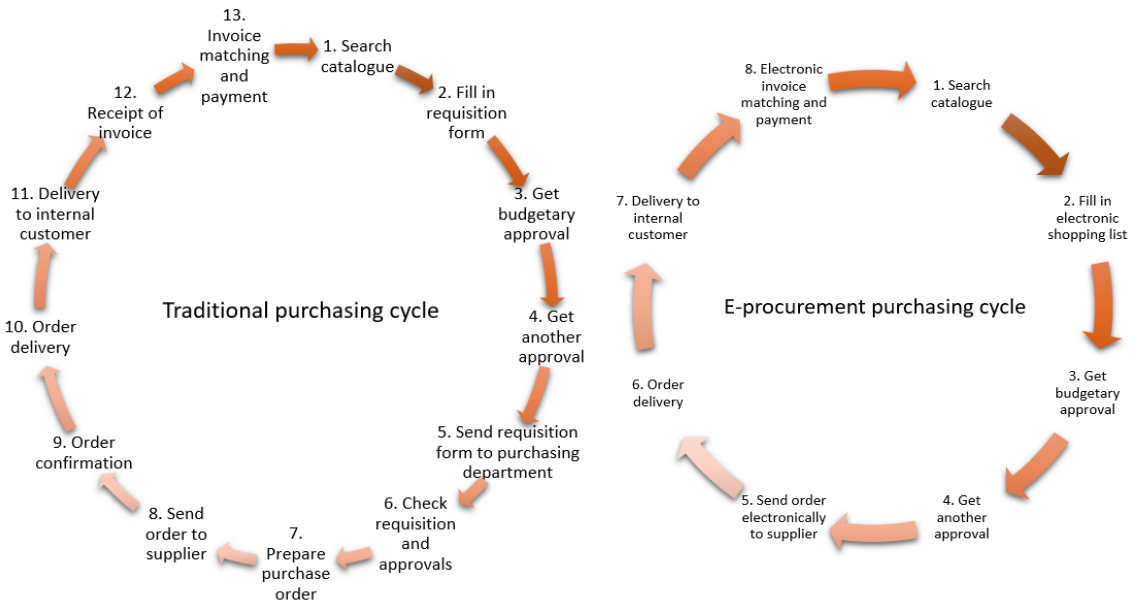

Figure 5. Traditional purchasing cycle compared to e-procurement purchasing cycle (modified from van Weele, 2002)

There are many ways to classify the benefits of e-procurement. For example, Tai et al. (2010) have developed a framework, which categorizes the impacts of e-procurement according to organizational boundary and performance hierarchy. Hence, in the organizational boundary dimension, the impacts can be either inter-organizational or organizational. In the performance hierarchy dimension, the impacts are either strategic or operational. Operational impact dimension is about operational efficiency and it includes buyer performance, supplier performance, process integration and process automation and hence, there are both organizational and interorganizational benefits. On the other hand, strategic dimension includes partner relationship, which is mainly related to interorganizational benefits. (Tai et al., 2010) Similar to Tai et al. (2010), Hung et al. (2014) have divided the impacts of web-based e-procurement systems into operational impacts and strategic impacts but in addition, they have added a third category called supplier externality. By supplier externality, it is meant the phenomenon in which the number of possible supply alternatives increases and therefore, the buyer's purchasing power and premium increase (Hung et al., 2014).

Furthermore, categorization between financial and organizational performance can be used. Financial benefits are quantitative, they can be monetarily measured, and these benefits can be achieved since e-procurement increases efficiency in the organizational structure. According to the authors, there are four types of financial costs: order costs, administrative costs, lead time and opportunity cost of capital, which could be reduced by using e-procurement. On the other hand, organizational benefits are usually qualitatively measured, and these benefits include control, transparency, decreased maverick-buying, decentralization and supply base rationalization. (Ronchi et al., 2010) According to Croom and Johnston (2003), e-procurement can improve procurement processes in five ways: firstly, it enables managers to get budgetary control, secondly, there are fewer failures in purchasing process due to stable and reliable process performance, thirdly, improved transparency and accessibility for all stakeholders in the whole process, fourthly, the system ensures compliance to process and lastly, since management is better informed, especially about prices, user compliance can be strengthened.

The last option is to use similar classification as classifying the measurements earlier: the benefits achieved from the implementation of e-procurement are divided into strategic, tactical and operational levels, as in Table 2. (Piotrowicz & Irani, 2010) Strategic advantages provided by e-procurement are often generated by strengthening trading relationships with suppliers (Tai et al., 2010). Tactical benefits, on the other hand, are often cost related (Hawking et al., 2004). Operational benefits are usually achieved due to automation of the procurement process, redesigning of the internal processes and sharing information (Tai et al., 2010).

Table 2. E-procurement benefits

	Benefit	Example Reference
Strategic	Increased competitive advantage	Piotrowicz & Irani (2010)
	Increased coordination with suppliers	Hung et al. (2014)
	Information flow between business units	Piotrowicz & Irani (2010)
	Supports strategic sourcing activities	Tai et al. (2010)
	Supports decision making	Hawking et al. (2004)
	Fraud prevention	Piotrowicz & Irani (2010)
	Supply market competitiveness	Gardenal (2013)
	Increased management and control of suppliers	Toktaş-Palut et al. (2014)
	Consolidation of purchased items	Croom (2000)
Tactical	Reduced transaction costs	Ronchi et al. (2010)
	Increased contract compliance	Hawking et al. (2004)
	Transparency	Gardenal (2013)
	Decreased maverick-buying	Ronchi et al. (2010)
	Supply base rationalization & bundling	Hawking et al. (2004)
	Internal control and monitoring	Croom & Johnston (2003)
	Better employee utilization	Gunasekaran et al. (2009)
	Price reduction	Hawking et al. (2004)
	Enhanced supplier searching process	Tai et al. (2010)
	Decreased bureaucracy and redundancy	Toktaş-Palut et al. (2014)
	Budgetary control	Hung et al. (2014)
	Increased reporting capabilities	Toktaş-Palut et al. (2014)
Operational	Faster order processing	Wu et al. (2007)
	Increased process quality	Toktaş-Palut et al. (2014)
	Timely payment	Mukhopadhyay & Kekre (2002)
	Decreased process errors	Toktaş-Palut et al. (2014)
	Improved tracking and tracing	Ash & Burn (2006)
	Time savings in overall purchasing process	Croom & Johnston (2003)
	Improved orders approval	Piotrowicz & Irani (2010)
	Reduced late payment penalties	Murphy (2012)
	Dematerialization	Gardenal (2013)

3.3.1 Strategic benefits

To start with strategic advantages, benefits, such as competitiveness, supplier, communication and prevention can be achieved, however, Piotrowicz and Irani (2010) suggest that the greatest benefits are obtained on tactical and operational levels. Still, the usage of e-procurement can help to get strategic level benefits, such as competitive advantage (Piotrowicz & Irani, 2010) and strengthening of the supplier trading relationships (Hung et al., 2014). Increase in the competitive advantage of a company can be achieved by improving response time for customer needs by using e-procurement (Piotrowicz & Irani, 2010). In addition, supply market competitiveness can be created by higher levels of market competition and lowering barriers to enter for suppliers (Gardenal, 2013). Higher supply market competitiveness is useful for achieving the best prices and the highest quality in the market of purchased goods or services (Gardenal, 2013). E-procurement systems are great tools for increasing suppliers' participation and therefore help to achieve competitiveness (Gardenal, 2013).

According to Tai et al. (2010), e-procurement can support strategic sourcing decisions in companies since by implementing e-procurement can help to transform the purchasing activity from an operational level activity into a strategic function. E-procurement makes possible to improve strategic activities, such as, increasing of management and control over suppliers (Toktaş-Palut et al., 2014) and enables improved coordination and integration with suppliers (Hung et al., 2014) since there is better information exchange in the relationships (Tai et al., 2010). Web-based e-procurement solutions allow to form integrated relationships, which remove inefficiencies and can have lower cost levels, with suppliers who may use different internal systems (Hung et al., 2014). Better management and control is provided since the system allows to find the suppliers with the most fitting price and quality and simplify the negotiation and contracting process by increasing transparency and communication (Toktaş-Palut et al., 2014).

Companies can get some internal strategic advantages by implementing e-procurement: information sharing (Piotrowicz & Irani, 2010), improved decision-making (Hawking et al., 2004), fraud prevention (Piotrowicz & Irani, 2010) and consolidation of purchased items (Croom, 2000). The information flow and exchange inside a company can be improved since e-procurement enables to share information with others pro-actively and get data (Toktaş-Palut et al., 2014). Decision-making can be enhanced since problems can be addressed by using real-time information, which supports reactive decisions, and increased information speed allows shorter decision-making process (Toktaş-Palut et al., 2014). Fraud prevention refers to reducing the risk of frauds, which can be related to, for example, payment, employees' actions or third parties and even tough it is intangible, it has great impact on organization's growth (Piotrowicz & Irani, 2010). Lastly, e-procurement supports consolidation of purchases by helping with leverage efforts, for instance, one organization had been reported to decrease its variety of office stationery products from 235 products to 38 products within two months after implementing e-procurement (Croom, 2000).

3.3.2 Tactical benefits

On tactical level, there are equally both tangible and intangible benefits (Piotrowicz & Irani, 2010). E-procurement provides information making purchasing more efficient and reliable especially in tactical level and hence, lowering strategic purchasing costs (de Boer et al., 2002). As earlier mentioned, Ronchi et al. (2010) state that cost savings are achieved by implementing an e-procurement system. On the other hand, Croom and Johnston (2003) suggest that process cost savings are obtained by reducing costs per order and internal savings are earned when improving materials management costs of purchased items. Piotrowicz and Irani (2010) propose that price reductions can be achieved through order-pulling, purchasing centralization and negotiations. In practice, these savings are realized as cost reductions in warehousing, transportation, transactions, service and buying costs (Piotrowicz & Irani, 2010). For instance, Mukhopadhyay and Kekre (2002)

have estimated that order costs could be decreased 12 percentage by using e-procurement.

Non-compliance is a great challenge in indirect procurement especially. However, if employees are provided with access to e-procurement system, purchasing department has greater control over the purchasing process. (Croom & Johnston, 2003) By using e-procurement, real-time control of spending is possible since all the data and information is controlled by the company (Ronchi et al., 2010). Related to non-compliance, maverick-buying, which causes internal inefficiency and higher total cost of ownership, can be reduced (Ronchi et al., 2010). Furthermore, reducing maverick-buying can potentially increase end-user compliance and therefore, contract compliance can be increased (Hawking et al, 2004). For instance, Cuganesan and Lee (2006) find that e-procurement can decrease maverick-buying between 40 and 30 percentage and de Boer et al. (2002), reported a company getting savings worth of five million euros per year. Lastly, supply base rationalization is possible to achieve by decreasing and restructuring of the supplier base (Ronchi et al., 2010) since the possibilities to order from new suppliers are limited due to e-procurement system. When focusing purchase orders for specific suppliers, consolidation of spending is improved, too (Ronchi et al., 2010).

Transparency is provided both internally and with suppliers when it comes to, for instance, contractual conditions, order tracking and terms of orders. System transparency and increased competition among suppliers, which can be obtained by easier communication and information access, can support to achieve enhanced quality and efficiency in procurement processes. (Ronchi et al., 2010) Furthermore, employees can be given greater accountability since providing them with budgetary information makes possible for them to control their own budgets (Croom & Johnston, 2003). In addition, real-time budget controlling and reporting can be done since there is continuous data to compare with budget (Toktaş-Palut et al., 2014).

E-procurement improves employee utilization for several ways. Firstly, employees who are working only with operational activities can be moved to work with more strategic activities. Secondly, since the purchasing process is more automated and streamlined, there is less manual work to do and there are less unclear and complex issues to figure out. Hence, employees are able to use their working time in a more profitable way. (Piotrowicz & Irani, 2010) End-users can also find potential suppliers faster since usage of e-procurement systems tends to increase search ability (Tai et al., 2010) because the system enables individuals to search for items (Croom & Johnston, 2003). Finally, since e-procurement allows to eliminate inefficient purchasing approval procedures and unnecessary repetition of services, it provides decreased bureaucracy and redundancy (Toktaş-Palut et al., 2014).

3.3.3 Operational benefits

According to Croom and Johnston (2003), operational advantages are identified to be the most significant reason for employees to start to use e-procurement. Benefits at the operational level are usually more tangible and financial in nature (Piotrowicz & Irani, 2010). The advantages at operational level are the greater the number of POs and internal customers is (de Boer et al., 2002). One of the advantages of e-procurement systems is improved process efficiency, which can be defined as the ratio of inputs to outputs (Janda & Seshadri, 2001). Some usual ways to measure efficiency are cost reductions and order processing time (Janda & Seshadri, 2001). Streamlined purchasing process allows faster overall purchasing processes (Toktaş-Palut et al., 2014) and faster order processing (Sriram & Stump, 2004). For example, in the research of Piotrowicz and Irani (2010), in one case company the processing time was estimated to be reduced from four days to four hours. Increased efficiency is created by forming a direct channel between suppliers and customers, which increases cost and supply function savings (Bromberg & Manoharan, 2015). By using e-procurement, it is possible to avoid inefficiencies and human errors in procurement processes since all the elements which are related to

manual, paper-based, administrative and bureaucratic work in purchasing systems are minimized (Bartezzaghi & Ronchi, 2005).

Because of automation and decreased cycle times, e-procurement systems support timely payments (Mukhopadhyay & Kekre, 2002), reducing unwanted late payment penalties (Murphy, 2012). Delayed payments are no good for either party since suppliers obviously aim at as few delays as possible (Mukhopadhyay & Kekre, 2002) and on the other hand, buyers want to pay on-time since by paying on-time it is possible to achieve discounts and there can be significant penalties if payments are not paid on-time (Mukhopadhyay & Kekre, 2002). Timely payments can be obtained by improving information systems and process management (Mukhopadhyay & Kekre, 2002). In addition, electronic invoicing enables automated invoice matching (Mukhopadhyay & Kekre, 2002). Other benefits related to automated invoice approval are, for example, less administration, no lost invoices and improved supplier relationships (Murphy, 2012).

In e-procurement environment, there is no need for paper and therefore, dematerialization can be increased. Companies are able to get rid of large amounts of documents, which can cause decrease in archiving costs. Also, since there is less need for paper, there are both environmental value and financial value in dematerialization. (Gardenal, 2013) Digital transactions also improve tracking and tracing of purchased items in the supply chain (Ash & Burn, 2006). According to Ash and Burn (2006), reduced inventory carrying costs and improved inventory turns due to e-procurement can be obtained. Instead of having high inventories of indirect suppliers, the organization could move towards approach of ordering when needed, which could improve internal customer satisfaction, reduce inventories and reduce paperwork (Croom & Johnston, 2003).

3.4 Successful change management in e-procurement implementation

Implementation of e-procurement solution can be a challenging task since there are lots of factors that should be considered: need for executive sponsorship, deep analysis of current processes, change management and integration with other systems. (Chang et al., 2004) According to Markus (2004), both the implemented solution and the implementation process are important since poor implementation increases the possibility to reject the system and if the system itself is poor, there will not be the wanted business results. To support the implementation process, Panda and Sahu (2012) suggest that e-procurement implementation strategy should be planned ahead and should concern opportunities that the implementation allows once implemented.

Once it comes to the actual implementation process, for instance, Chang et al. (2004) suggest five steps to include in implementation process: analyzing business process, collecting business requirements, synchronizing of data and business process with suppliers, mapping software functions with current practices and determining deliverable and measures for evaluation. The process starts of by determining how goods and services are currently purchased and what kind of interactions there are between organization's departments. Business requirements are needed to collect and return on investment (ROI) should be calculated. As earlier introduced, these requirements can be classified several ways, however, when collecting the requirements, there should be data from various departments. All the data should be rationalized and synchronized with internal systems and suppliers' systems since multiple data formats are more complex to manage and there is a risk for data duplication. Then, the current practices should be aligned with software functions and therefore, some processes need to be modified or eliminated when moving into e-procurement system. Finally, the measures should be decided for the evaluation. It is recommended to compare the current values to the values achieved after implementation process. (Chang et al., 2004)

When it comes leadership, change leadership is crucial in organizational change. Change leadership refers principles, techniques and activities which are applied to the human aspects of implementing change to impact on acceptance and reducing resistance. (Griffith-Cooper & King, 2007) The skills and abilities of a leader play a significant role in successful change management (Gilley et al., 2009). The real skills of the leader can be seen in the person's actions, enhancing or impeding change and empowering the connection between behavior and effectiveness in change implementation (Gilley et al., 2009). Some beneficial traits for leaders are coaching, communicating, involving others, motivating, rewarding and promoting teamwork (Gilley et al., 2009). Especially change effectiveness is predicted by ability to motivate others and communicate effectively (Gilley et al., 2009). Providing training of change implementation techniques to leaders at all levels is related to successful change (Gilley et al., 2009).

To increase the probability of successful implementation of e-procurement system, there are several factors that could be considered. For instance, Rotchanakitumnuai (2013) proposes that organizational learning is impacted by service capability, good governance intention, management support policy and organizational readiness. Service capability consists of responsiveness and service accuracy of the service. Good governance intention refers conducting of best practices of e-procurement. Management support policy means positive commitment of management, adoption abilities of the organization and support in e-procurement training. Lastly, organizational readiness means the extent there are sufficient IT resources and knowledge to use e-procurement. (Rotchanakitumnuai, 2013) Angeles and Nath (2007) have identified three success factors: supplier and contract management, end-user behavior and e-procurement business processes and lastly, information and e-procurement infrastructure.

3.4.1 End-user acceptance

When implementing an e-procurement system into an organization, employees, also known as internal customers, have a crucial role (Brandon-Jones & Kauppi, 2018). Satisfied internal customers are important from the implementation point of view since they are more likely to reuse the system and by that way increase procurement process compliance (Croom & Johnston, 2003). Especially, often the changes are not limited just to the division, in which there is a system implemented (Sharma et al., 2008) but the other divisions too, which makes implementation more complex.

There has been identified many possible ways to implement an IT system into an organization. One of the first introduced and probably most used ways to implement e-procurement is the technology acceptance model (TAM) as illustrated in Figure 6 (Davis et al., 1989). The main goal of the model is to provide determinants for IT acceptance, which explains end-user behavior, why a system can be unacceptable and how to improve acceptance and therefore, TAM is helpful to find the external factors impacting internal beliefs, attitudes and intentions (Davis et al., 1989). There are two main causes why employees either accept or reject a new system: perceived usefulness and perceived ease of use (Davis, 1989). Perceived usefulness refers people's tendency to use or not use a system to extent they think it will help them (Davis, 1989). On the other hand, it is not enough that the system is helpful: perceived ease of use means the degree an employee thinks the system is effortless to use (Davis, 1989).

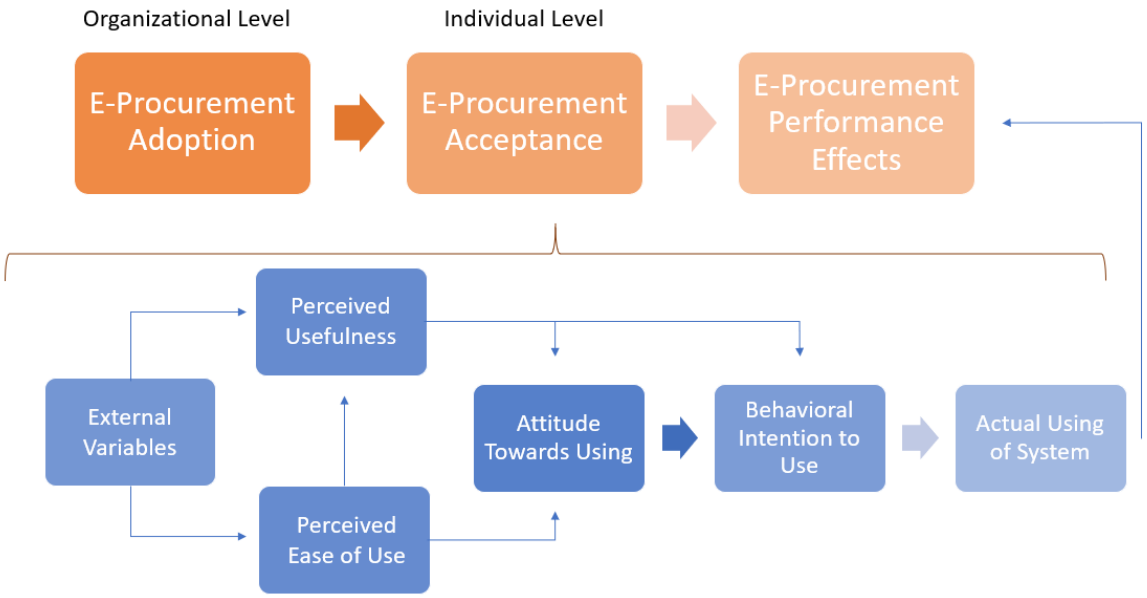

Figure 6. Technology adoption and acceptance (modified from Davis et al., 1989 and Brandon-Jones & Kauppi, 2018)

Brandon-Jones (2017) has identified five dimensions which form the quality of e-procurement for internal customers: processing, content, usability, professionalism and training. These five dimensions can be used as a base to explain the adoption of e-procurement system among employees. Processing refers to the speed of order-processing, the ease of authorization, overall lead time, order accuracy and the time requisitions take arrive to suppliers. Content is related to the catalogues and suppliers found on the system and how easy it is to find the wanted content. Usability means server speed, the ease of navigation and perception of system availability. Professionalism is the support provided for internal customer concerning e-procurement, such as availability, responsiveness, reliability and knowledge. Lastly, training consists of the availability of training, the timing of training and getting additional information. (Brandon-Jones, 2017)

Brandon-Jones and Kauppi (2018) have also discussed e-procurement as a technology acceptance issue and the authors use the TAM as a base for their research. The key antecedents related to employee-level acceptance are crucial to understand since they support the implementation process of e-procurement

systems when organization-level adoption decisions are made. (Brandon-Jones & Kauppi, 2018) According to Brandon-Jones and Kauppi (2018), the antecedents processing, usability and professionalism, which have been earlier identified in the study of Brandon-Jones (2017), are the most important factors impacting on user-perceived e-procurement quality. Therefore, optimization of order lead times, performance of order processes and developing easily understandable user-interface could be considered even more when attempting to increase individual-level acceptance (Brandon-Jones & Kauppi, 2018). However, as opposed to the original TAM, Brandon-Jones and Kauppi (2018) propose that there is no connection between perceived ease of use and attitude in the context of e-procurement.

3.4.2 Organizational characteristics

Some other factors impacting on implementation of e-procurement are two forces identified by Wu et al. (2007), which defines the adoption of an innovation in organizations: organizational characteristics and environmental factors. Organizational characteristics include the factors top management's commitment and organization's ability to learn. Organization's ability to learn consists of learning the systems and understanding how the systems can be used in the organization. If there is no such capabilities or motivations for such learning, organization's ability to learn may create knowledge barrier. (Wu et al., 2007) Hence, there needs to be organizational capabilities, willingness and motivation to introduce successfully IT into existing routines (Ravichandran, 2005). Organizational IT capabilities can be defined as IT-related managerial ability that enables to incorporate IT assets to target goals (Oh et al., 2014). However, it should be noticed that a company's resources are limited and hence, the proper IT capability for the company's business environment should be recognized and focus on increasing that capability (Oh et al., 2014). Organizational readiness helps to improve learning and skills of personnel and therefore, it can make the implementation easier (Rotchanakitumnuai, 2013).

Often, there are heavy investments related to technology investments and also there is a need to gain the acceptance in multiple functional areas and therefore, top management's commitment is required for successful implementation. (Wu et al., 2007) Top management should understand the capabilities and limitations of the new system, approve the system, identify the project as top priority, align the system with the business strategy, allocate enough resources and finally, create appropriate work culture (Panda & Sahu, 2012). In addition, management's support has been identified to have a positive impact on organizational learning and employee satisfaction, which increases the importance of management's commitment (Rotchanakitumnuai, 2013).

Some of the most relevant success factors are appropriate training and education of employees in order to them to adopt the new technology. The acceptability of the system and transition into the system are depending on the training. There should be a supportive and well-planned environment in which all problems related to the system are addressed in a user-friendly way. (Panda & Sahu, 2012) For example, providing training in operating of new IT tools, explaining the system's change impact on business processes (Wirtz et al., 2009), creating own in-house training for employees (Vaidya et al., 2006) and encouraging to continuous learning and training (Wirtz et al., 2009) will help employees to adopt the system. In addition to training, user support, such as help desk system, call center or online help, is often needed (Panda & Sahu, 2012). Interestingly, some other researches have received conflicting results suggesting that training and support do not have significant impact on user acceptance. For example, according to Brandon-Jones and Kauppi (2018), there is less need for training if the system is usable and there are information and product flows between the buyer and suppliers. However, as earlier mentioned, training is still needed to increase the quality of e-procurement (Brandon-Jones, 2017). Also Purchase and Dooley (2010) propose to allocate resources somewhere else, for instance supplier participation, instead of training.

Lastly, communication between participants has been identified as one of the success factors in e-procurement system implementation. Hence, communication between participants should be encouraged. (Gunasekaran et al., 2009) Furthermore, it has been discovered that awareness of possible task enhancements improves e-procurement motives (Purchase & Dooley, 2010). Therefore, it is important to focus on communicating all the positive impacts of the system for the organization (Purchase & Dooley, 2010). Both formal, such as policies related to e-procurement, and informal, such as word of mouth targeted on users and suppliers, communication channels can be used in the communicating process (Purchase & Dooley, 2010).

3.4.3 External factors

Wu et al. (2007) have also identified environmental factors, also known as external factors, which may cause adoption of innovations, such as e-procurement, since external pressures may cause fear of being left behind in competition if they are not investing on the same innovations. In addition, it has been found out that also the software provider can help in the implementation process. (Wu et al., 2007) For example, Ravichandran (2005), suggests that by sharing technology specific knowledge in close interaction with adopters, software providers are able to reduce knowledge barrier and support implementation.

Dai and Kauffman (2006) propose that the implementation of e-procurement system requires participation efforts from the company itself but from suppliers, too. Usually, some companies decide to adopt e-procurement channel and encourage their partner companies to adopt the related technology. Suppliers are needed to be in the e-procurement environment, and some suppliers are requested to make their systems compliant with the buyer’s system. (Dai & Kauffman, 2006) Therefore, Bottani and Rizzi (2005) remind that implementation of e-procurement system sets also new challenges to supplier selection and suppliers since it is important that they

are capable to manage electronic catalogues or electronic orders and in addition, they should be able to automate inefficient B2B financial settlements.

3.5 Barriers in e-procurement implementation

Although, there are many advantages in e-procurement systems, often there are also barriers when trying to implement an e-procurement system. Markus (2004) states that if e-procurement implementation is only treated as an IT project, there is a risk that organizations do not realize the problems related to implementation or unintended consequences. According to Angeles and Nath (2007), there are three main issues when implementing e-procurement: lack of system integration and standardization issues, immaturity of e-procurement-based market services and end-user resistance and finally, maverick-buying and difficulty in integrating e-commerce with other systems. On the other hand, Johnson (2010) finds e-market adoption related challenges: risk perception, knowledge deficits, trust, firm size and organizational readiness.

3.5.1 Resistance to change

One of the main problems in IT implementation projects is employees' resistance to change their current practices (Ronchi et al., 2010), as Toktaş-Palut et al. (2014) mention, resistance to change is a part of human nature. Some employees refuse to adopt the new system since they may fear that the system is too much work to adopt and learn (Costa et al., 2013). To avoid this problem, it is important to understand the reasons behind the resistance and how to prevent it since preventing the problem is considered to be easier than eliminating the resistance after it has emerged (Markus, 2004). Also, as previously stated, companies should encourage to the learning of the new system by offering intensive training and education session for the end-users (Angeles & Navi, 2007). The experience of using the system should be effortless in order the end-users to be able to focus on more value-

adding tasks which are more important in their jobs (Angeles & Navi, 2007). If a firm does not have capabilities or motivation to learn, ability to learn may create a barrier which prevents a successful implementation of e-procurement system (Wu et al., 2007). Furthermore, lack of training or education may cause negative effects of internal resistance to change (Toktaş-Palut et al., 2014). Lack of education and training may also lead to lack of skilled personnel, such as inadequate computer and software using skills (Rotchanakitumnuai, 2013).

Maverick-buying is related to the lack of internal control and also related to resistance to change since eliminating maverick-buying requires to changing purchasing behavior on behalf of employees. Even after e-procurement implementation, maverick-buying can be hard to eliminate. (Angeles & Navi, 2007) Although maverick-buying is done at individual-level, it can emerge also at organizational-level since resistance can spread among employees. Therefore, it is extremely important to show the advantages of the new system to end-users, involve them into cost savings targets and show them in practice how the targets can be achieved by providing training and education (Angeles & Navi, 2007).

3.5.2 Internal challenges

According to Toktaş-Palut et al. (2014), there are some organizational culture issues, for instance lack of leadership and lack of information quality, which cause incompliance with company culture and can therefore decrease e-procurement implementation success. Leadership in the form of change management is required to support business processes (Vaidya et al., 2006). Lack of information quality is another significant reason for slow adoption as well as lack of informing the benefits of the new system (Caniato et al., 2010). Toktaş-Palut et al. (2014) also mention issues such as lack of clear corporate policy, lack of control and resistance to change.

Wu et al. (2007) recognize that the implementation barriers in strategic level can also reduce successful implementation since there is required a significant shift in procurement process if the current business process are inadequate to support e-procurement. Both internal and external process changes are needed, and they need to be managed and started by top management (Caniato et al., 2010). Furthermore, lack of top management support can result in as lack of coordination since interdependence in process changes increases (Sharma et al., 2008). Therefore, it is critical to increase the awareness of top management and explain the benefits and opportunities of e-procurement in order to obtain support and commitment (Gunasekaran & Ngai, 2008). According to de Boer et al. (2002), the best way to attract top management is to convince them that the savings are worth of the investment.

3.5.3 External barriers

In addition to the challenges coming from inside the implementing company, there are external factors, which should be taken into account but possibly cannot be managed. Many of the external barriers are related to IT challenges and technology uncertainty. For example, according to Toktaş-Palut et al. (2014), the greatest barrier is inadequate IT infrastructure of business partners since these challenges can lead to inadequate IT structure and inadequate e-procurement knowledge and lack of skilled personnel. Therefore, attention should be paid into, for example, management of IT infrastructure of suppliers (Toktaş-Palut et al., 2014). On the other hand, as Wu et al. (2007) state, management of suppliers has an important role in implementation process. One of the major risks related to suppliers is them not using the technology (Markus, 2004). Suppliers can be unwilling to participate e-procurement in case they perceive no advantages in participation (Johnson, 2010). However, if suppliers are not adopting the system, the internal resistance to change can be increased (Toktaş-Palut et al., 2014). Hence, broad information exchange is needed between the parties.

When it comes to the e-procurement solution itself, even though customization is undeniable needed, it should be carefully considered the amount of customization since there are issues related to excessive modification of the system. For example, excessive modifications can increase implementation time. (Kite & Fletcher-MacDonald, 1999) Also, some categories, such as services, might be more difficult to manage through e-procurement (Ronchi et al., 2010) and therefore, e-procurement system might not be ideal for all purchasing categories. Another significant barrier is malfunctioning of the e-platform itself (Costa et al., 2013), which does not help to convince end-users of the usability of the system.

As earlier mentioned, solution provider selection is important since there can be challenges with the system provider. Firstly, if there is not enough cost transparency with the vendor, it is possible that there are some hidden costs which can have huge cost impacts. If the vendor does not have much previous experience on launching e-procurement projects, costs related to, for instance, system integration, catalog and search engine transaction and business process re-engineering can be easily five to ten times higher than the cost of the software and maintenance. (Angeles & Navi, 2007) Furthermore, there are still other systems, such as EDI, which often remain in companies even after adoption of e-procurement, which creates a need to include these systems into the e-procurement infrastructure (Puschmann & Alt, 2005). Therefore, attention should be focused on the integration capabilities of the vendor with back-end systems (Chang et al., 2004).

4 RESEARCH DESIGN AND METHODOLOGY

This part of the study discusses the design of research and why the chosen methodology, which is qualitative case study, has been selected for this study. First, the basic principles of case study methodology are explained and the reasons behind the chosen methodology are given. This is followed by description of the interview situations and the collected data. Lastly, validity and reliability of this study are going to be examined and there are supporting arguments given for them.

4.1 Research methodology

The method used in the research is qualitative single case study. Case research can be described as a research method, in which one or a small number of situations are studied by collecting data from multiple sources and developing a comprehensive picture by an iterative research process. In a case study, one of the most defining characteristics is sampling since a case is a single example, meaning that the one case should provide understanding of a phenomenon in depth. The case study approach is suitable for how and why questions since those kinds of questions can be explanatory. (Easton, 2010) In addition, there are some characteristics of action research in the research since the researcher acted with practitioners during the research. Action research is a combination of research and practical actions, in which the researchers act with practitioners in order to improve practice and build theory (Nielsen, 2016). Qualitative case study was selected since it was seen as the best fit to conduct the research because there was only one company studied in the research and as earlier explained, case research is suitable method to study smaller number of situations. Qualitative research was chosen since the best way to achieve the needed data was to conduct interviews with the personnel of the company.

4.2 Data collection and description of the data

The data was collected in the case company and there were internal interviews done. There interviews were held on three separate days: on the first day, there were three interviews, on the second day, there also were three interviews and on the last day, there were two interviews. Interviews were mainly held face-to-face, however, one was held via Skype. All the interviews were kept in Finnish language and the interview questions were translated into Finnish. The interviews were conducted as semi-structured interviews and all the interviews were recorded. Before the interview days, there was an experiment held to test the interview questions. Based on the experiment, one hour was reserved for each interview and some questions were adjusted to improve the quality of the upcoming interviews. Most of the interviews lasted from 30 minutes to 45 minutes.

As seen in Table 3, most of the interviewed people were positioned in the middle management of the company. Interview invitations were send to 15 persons and interviews were agreed with 11 persons. However, due to some cancellation, the total number of nine persons were interviewed and, in some cases, there were people interviewed who were not in the original list of the people that should be interviewed. The interviewed people were from multiple different departments, such as direct purchasing, maintenance and product marketing. The percentage of men was around 67 percentage and the percentage of women was around 33 percentage. All the interviewed people were working at the same site.

Table 3. Research data description

	Representation of research data
Place of interviews	One of the sites
Number of interviews	9
Interview types	8 Face-to-face, 1 Skype
Gender diversity	Males 66 % / Females 33 %
Positions of the interviewees	Financial Controller
	Marketing Manager
	Director HR and Site Manager
	HR and Site Services Manager
	Prototyping and Testing Manager
	EHSQ Manager
	Operations Manager
	Facility and Maintenance Manager
	Unit Sourcing Manager

4.3 Reliability and validity

According to Carmines and Zeller (1979), reliability of a research "concerns the extent to which an experiment, test, or any measuring procedure yields the same results on repeated trials". Therefore, the higher consistency the results have, the higher the reliability of measurement is. On the other hand, validity refers to the relationship between concept and measurement. However, it is possible to have a reliable measurement but still the validity of the indicator can be poor. Hence, it is important to assess the use to which the measurement is put. (Carmines & Zeller, 1979) In this research, all the interviews have been recorded and then transcribed, which increases the reliability of the research since the interviews have not been analyzed just based on the notes made during the interviews. Also, although only employees from the case company were interviewed, the interviewed employees were from different departments and functions to increase the amount of information sources and get different points of views. However, the interviews were translated from Finnish to English, which might have some impact on reliability. When it comes to the validity of the research, the collected data was analyzed based on the interviews and observations made in the case organization.

5 THE CASE COMPANY AND CURRENT STATE

In this part of the study, firstly, the fields of business, which are construction and mining industries, are going to be introduced to give some insights of the context of the study. Then, the structure of indirect procurement function and the indirect sourcing categories will be described. Lastly, the current state of the indirect procurement process and sourcing tools are presented, especially focusing on the current risks that can be found on the current practices.

5.1 The business environment

Minerals are essential raw materials since they are used in, for instance, building, computers, cars and household devices. In the EU, the mining industry is vital to industrial, social and technological development. The industry can be divided into sub-categories: construction minerals, industrial minerals and metallic minerals, depending on the characteristics of the minerals. (European Commission, 2018) Currently, some of the main challenges of the industry are digitalization, innovations, changing perceptions towards the industry, achieving measurable social outcomes, water management and sustainability (Deloitte, 2018). On the other hand, construction industry refers to building and maintenance of buildings (Rakennusteollisuus, 2018). In Finland, construction industry and maintenance are significant employers (Rakennusteollisuus, 2018) but the industry is well-known for its economic fluctuation. In the industry, some significant challenges are caused by poor productivity and profitability, project performance, skilled labor shortages, sustainability concerns and digitalization (Leeds, 2016).

5.2 Indirect purchasing department

The company has both direct and indirect procurement departments in place. In Finland, there are direct procurement departments at each site and then there is an

indirect procurement team, which is responsible for all indirect purchasing in Finland. The indirect purchasing department in Finland has been established in 2007. There are seven people in total in the indirect purchasing department and three of them are located on one of the sites, four of them are located on the other site and then there is no indirect procurement representatives on the smallest site. The team mainly consists of category managers; there are five category managers in the team, a head of indirect procurement and a purchaser. Each of these managers has one or more categories which they take care of. There are totally ten indirect purchasing categories, which are facility management, energy, IT and telecom, logistics, communication and promotions, travel and cars, professional services, production equipment, MRO, and packaging and labels. In addition, there are various sub-categories underneath the main categories.

As the indirect purchasing department in Finland, is only focused on indirect procurement actions in Finland, therefore, it could be said that there is no centralized indirect purchasing department at the corporate level. Hence, there is no one centralized strategy for all countries. However, in country level, the indirect purchasing department is centralized. Earlier there has been a more centralized structure in the corporation and there is still higher-level strategy in the travel category. In other purchasing categories there is no such high-level strategies. For instance, there is possible to negotiate both site and country level contracts and depending on the category, the most fitting options is chosen. Also, in the case company, one of the trends in category management is to reduce supply base, especially focusing on limiting the amount of small and one-time suppliers.

5.3 Current state of indirect purchasing process and tools

Currently, there are two types of purchasing processes for internal customers in indirect procurement: a process for current suppliers and then a process for new suppliers. These processes are more general in nature and then there is more official sourcing process called BASE, which defines more in detail sourcing

processes for both direct and indirect purchasing. As seen in Figure 7, the ideal purchasing process for current suppliers includes some basic elements, similar to phases introduced earlier when examining purchasing process models. Firstly, purchase orders are requested for approved suppliers, then purchase orders are confirmed and the ordered goods or services are received and finally, invoices are received and verified. Purchase orders should be sent as well as order confirmations should be received in a written form.

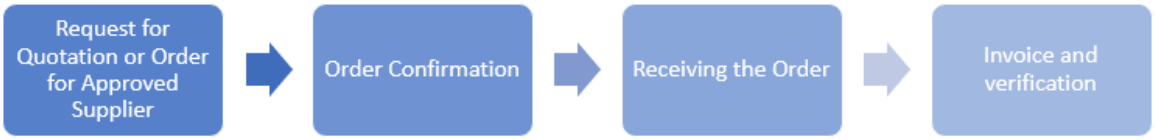

Figure 7. The purchasing process for current suppliers

In Figure 8, there is described the purchasing process for new suppliers. As seen in the stages, the first step should be contacting indirect purchasing department which supports choosing the most suitable supplier for the company. Also, it is desired due to invoicing issues that suppliers are added in the supplier database as actual suppliers before there is any invoicing actions. Therefore, indirect procurement is needed in contracting and documentation when establishing relationships. The next step is to open a competitive tender among suppliers in case there are at least three potential suppliers and the value of the purchase is more than 3000 euros. Then, the best fitting supplier is chosen, and a contract and other applicable documents can be made. For instance, Code of Conduct, non-disclosure agreement (NDA), the Act of Contractor's Obligations and Liability and terms of purchase are generally used appendices in the case company.

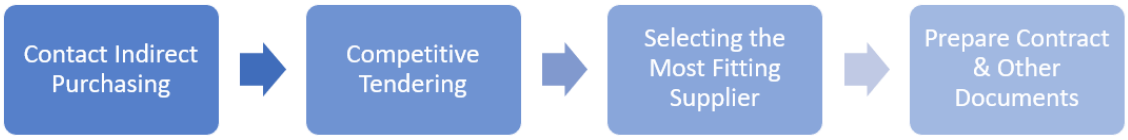

Figure 8. The purchasing process for new suppliers

As seen in Figure 9, the sourcing process BASE stands for baseline, assess, select and execute. After BASE has been conducted, as the end result, there should be supplier selected, signed contract and goods and services available for ordering. There are four process levels in the case company's sourcing process. First level refers to the overview of sourcing process, which explains the relationships between the different sourcing processes since there are various situations in which BASE could be used and these situations can be divided into sourcing process-based or external process-based. Sourcing process-based triggers include, for instance, category management process and strategy development. Another example of BASE could be supplier relationship management or operational processes. External process causes could include issues, such as new product development, demand management or make or buy analysis. On the other hand, BASE itself also triggers various processes, such as supplier management, supplier quality and sustainability management and materials management.

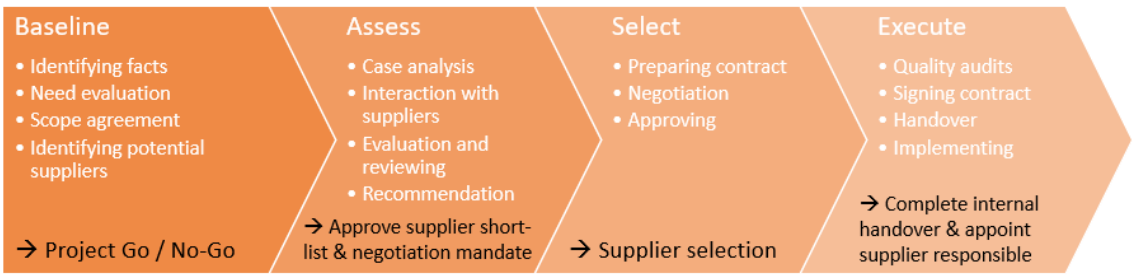

Figure 9. Sourcing process BASE

Second level describes the actual process steps: baseline, assess, select and execute. Each of these steps includes third and fourth level processes; third level defines the purpose of the step and fourth level the actions that should be done by employees. The sourcing process starts with step baseline, in which it is supposed to decide whether the sourcing process will be carried on or not. For instance, the need is evaluated, and potential suppliers are identified. Next, the potential suppliers are evaluated further to get a shorter list of approved suppliers to choose from. Then,

the most fitting supplier or suppliers are chosen and contracts are started to be prepared along with negotiations with the other party. Lastly, there is execution which can include auditing of suppliers, implementation of contract and initiating of handover, for example. However, in direct sourcing BASE fits very well but the greatest difference when it comes to indirect purchasing, is cross functionality starting at the beginning of BASE and continuing to the end of sourcing process. Therefore, internal handover is not as significant in indirect purchasing compared to direct sourcing, and supplier responsibles are selected at the beginning of the process.

When it comes to the current tools of indirect purchasing department, there are already some existing tools used to support indirect purchasing but there has not been a web-based e-procurement system in place. Most of the used tools are either web-based or on Excel. However, these tools are not very well integrated, and the tools are not communicating with each other. Many of the tools support reporting but none of them is able to actually control employees' buying behavior. One of the tools is called Flower, which is a tool for invoice handling. In Flower, it is possible to look at invoices and pay them. However, the tool is not popular among employees and many of them describe Flower as, for example, slow, inflexible and inconvenient. The implemented e-procurement solution is going to replace Flower as an invoice handling tool but replacing is not going to happen immediately. Hence, Flower and the new system are going to operate side-by-side for a while.

5.3.1 Risks in the current process

The risks of current process in the case company were mainly identified through interviews with employees and discussion with indirect purchasing personnel. Illustrated by Figure 10, in total, there are four main risk types identified: inefficient purchasing process, inflexibility, lack of internal control and supply base related risks. The risks in these groups range from internal practices to more suppliers related risks. Percentages in horizontal axel indicate the number of employees

mentioning the same risk. Inefficient purchasing process has been mentioned directly only by few employees, however, when considering the overall interviews, it could be said that almost all respondents considered this factor at some level. Inflexibility related to the difficulty to open new suppliers has been mentioned to be a restricting factor and risk. Lack of internal control could be probably one of the most important factors and this risk has been identified in different departments and at different organizational levels. Supply base related risks, such as, too broad supply base or unknown risks of suppliers have been recognized as problems in current practices too.

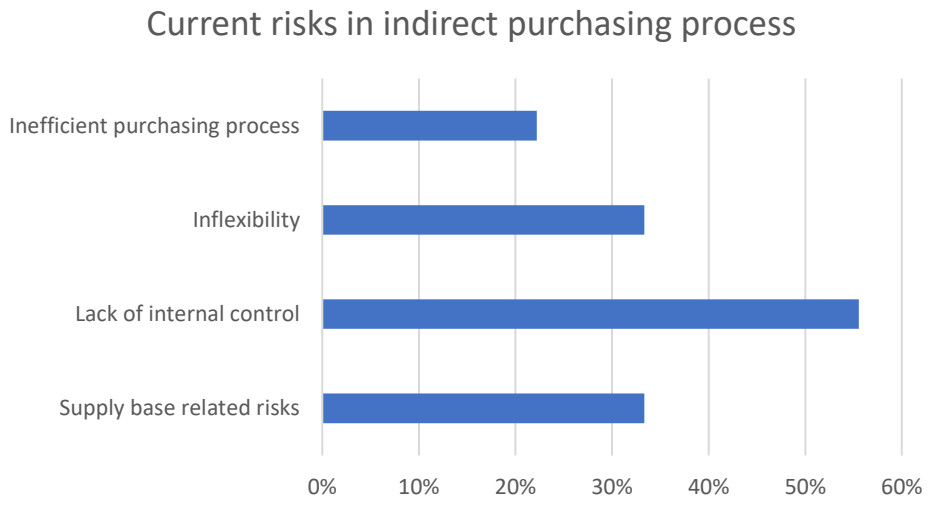

Figure 10. Current risks in indirect purchasing process

As described in the previous chapter, there are actual processes in place in the indirect purchasing process, which strive for control. However, the purchasing processes are sometimes not that well understood or followed among the users, which are some of the reasons for non-compliant behavior. Also, in practice, the purchasing process is not as simple as it seems to be in the process model: when an end-user wants to purchase a specific good, there are some quite outdated practices to achieve the permission to order, for instance, sometimes even slips of paper are used to get the permission to order the good, which inevitable makes asking permission more complex and uneasy process. This leads to user behavior

in which instead of approving the purchase order before ordering, it is a common practice to first order the purchase and then approve the order later. This kind of approach clearly nibbles away internal control and is not encouraging to compliant behavior.

The earlier described purchasing process is also a root cause behind many of the answers received in internal interviews. When there is no internal control, end-users are quick to use whatever suppliers they see the best to fill their personal needs, which is not always the same than the company's needs. Although there are available lists of approved and preferred suppliers, which should be used in making purchases, these suppliers on the lists can be easily ignored, leading to increasing supply base since there is a new supplier for every new purchase. Also, as one of the respondents points out, when ordering from random suppliers, these suppliers are not evaluated, and the risks of the suppliers are not known which can, in the worst case, cause harm to the whole company. Sometimes only foreign suppliers are perceived as the risky ones but, in reality, there are plenty of risks related to domestic companies too. In addition, lack of internal control makes possible duplicate orders since, for example in shift work, there is no proper data available if something is ordered or not, and then, there is a possibility for misuse.

Another fundamental problem in the current purchasing practices is asking one-time suppliers, which often provide consumer goods, to send their invoices later to the company's address since this makes them as suppliers for the case company. Furthermore, due to internal factors, the cycle time of invoices is alarming high, often more than a month, and payment terms are usually short, such as seven of fourteen days, when using non-approved suppliers since these kind of supplier relationships cannot be well-managed and therefore, there have not been negotiations with these suppliers in order to provide longer payment terms for the case company. The invoice processing has been centralized in Europe and all the invoices are processed in this service center, so it takes time to send invoices back and forth. Hence, the amount of payment obligations is relatively massive.

Also, some respondents feel that there are risks related to the department of indirect purchasing: restricting end-users possibility to choose suppliers, slowness of the department and country level contracts. Especially, restricting possibility to choose suppliers and inflexibility to add new suppliers are a bit conflicting with the other responds to decrease supply base and increase internal control. Some of these respondents did not identify lack of internal control as a problem in their department but some clearness to the process was hoped. Most of respondents are afraid of bureaucracy and the indirect purchasing department taking a charge of communicating with suppliers and choosing some other supplier instead of the supplier they want. Also, they fear that their needs are not listened enough and one of the respondents points out the different needs of business sites when it comes to, for example, cleaning services.

Overall, there are a lot of variety in purchasing practices just in one site and in some departments or functions, the defined processes in indirect purchasing are more followed and, in some others, there is less compliant end-user behavior. As one of the interviewees mentions, all employees may not have understood the big picture and therefore, they might not even realize all the consequences their non-compliant behavior can potentially have. Some of the respondents mention slowness of indirect purchasing department and slowness and unclearness of purchasing process as the reasons for not following the formal and defined purchasing process. These reasons suggest that the purchasing process of indirect purchasing could be more simplified, unnecessary steps could be eliminated, and the purchasing process could be made clearer for end-users. The implemented e-procurement solution is therefore wanted to tackle these earlier mentioned challenges.

6 MEASURING OF INDIRECT PURCHASING PROCESS

In this part the indicators for indirect purchasing process are introduced from the case company point of view. The measurements proposed next are not yet implemented in the case company and these have not been measured earlier. There are both more general indicators and then there are indicators that could be suitable for some specific indirect purchasing group. All the indicators are not necessarily to use at the same period; for example, some of the measurements could be used to in the beginning phase of the implementation and other indicators after the implementation project has ended and there is a need to follow-up progress.

Currently, the indirect purchasing department is following the measurements contract coverage, number of active suppliers and payment term development. Spend per supplier and per category are followed occasionally too but obviously those numbers are very dependent on the investments and they can vary a lot, which does not make those the best indicators. Some new measurements are aimed to implement together with the e-procurement system since there is more data available due to the possibility to store data in the system. Also, by implementing new measurements, the purpose is to be able to monitor internal control and end-user behavior and get precise data that can be used to support decision-making.

6.1 Measurements for the e-procurement system

Measurements proposed for the case company to the implementation and following are based on the earlier introduced Table 1, which is completely theory-based and in addition, more indicators have been added that were suggested during the interviews. The interviewees were asked if they had any measurements in mind that could be used to measure the benefits of the e-procurement system, and these indicators have been collected into Table 4. The final set of combined measurement can be seen in Table 5.

Table 4. Indicators identified from the interviews

Proposed measurements
Amount of (interest) payment obligations (qty)
Percentage of invoices paid on time (%)
Cycle time of invoices (d/w/m)
Tender prices vs. current price (€)
Amount of new suppliers (qty)
Efficiency of indirect purchasing
Purchasing transaction volume (qty)
Spend before vs. after (€)
Contract compliance (%)
Purchase order cycle time (d/w/m)
Category / supplier level cost trends (€)
Amount of transactions vs. amount of transactions on Flower (qty)
Spend development per supplier (€)
Budget compliance (€)
Delivery reliability (d/w/m)
Costs savings generated by bundling (€)

The measurements in Table 4 are quite well distributed between financial and non-financial measurements. Tactical and operational level measurements are more represented compared to strategic ones. Most indicators have been approved by researchers and therefore, there are similar indicators presented in theoretical part. For most of the indicators, there are measurement units proposed too, € meaning monetary, qty meaning quantity, % referring to percentage and d/w/m standing for day/week/month. However, for efficiency of indirect purchasing, there is no unit since it is a more higher-level indicator and actually some of the indicators partly measure efficiency of indirect purchasing. Compared to the current measurements indirect purchasing is using, there are some new indicators, which could be useful to measure in order to be able to reduce current risks in the purchasing process.

Table 5. KPIs to measure purchasing performance

	KPIs in performance measurement
Strategic - Non-financial	Spend per supplier/category (%)
	Number of suppliers (qty)
	Goods or services with multiple suppliers (qty)
Tactical - Financial	Total cost of purchase (€)
	Purchasing price development (€)
	Real-time spending vs. budget (€)
	Labor cost savings (€)
Tactical - Non-financial	Contract coverage in a specific category (%)
	Maverick-buying ratio (%)
	Supply source selection cycle time (d/w/m)
	Usage of e-procurement in a specific category (%)
Operational - Financial	Cost per invoice (€)
	Automated invoice matching ratio (€)
Operational - Non-financial	Number of errors (qty)
	Average time of processing a purchasing request (min/h/d)
	Delivery time (d/w/m)
	Payment term compliance (%)
	Amount of (interest) payment obligations (qty)
	Average time of making a purchasing order (min/h)
	Number of purchasing orders (qty)
	Invoice cycle time (d/w/m)
	Purchase order cycle time (d/w/m)

The final measurements aim to consider especially indirect purchasing and the indicators have been divided furthermore to have both financial and non-financial indicators and there are only quantitative measurements since in the case company, there is a greater need for quantitative measurements. As in the previous table, this table also includes specific measurement units defined to support utilization of the performance measurements. The measurements are planned to be as concrete as possible to illustrate the benefits of e-procurement at different organizational levels. At strategic level, financial aspect can be difficult to measure and therefore, the focus is on non-financial indicators. Spend per supplier or spend per category measured as percentages is useful to indicate how e-procurement impacts on the spend development of a specific supplier or category, which supports decision-making, for instance. Number of suppliers helps to see if the case company has managed to reduce the number of suppliers, which is one of the aims of the

company. Also related to supply base reduction, if the number goods or services with multiple suppliers is measured, the case company is able to identify all unnecessary suppliers and again, decrease the number of suppliers by focusing the purchases for fewer number of suppliers.

On the other hand, at tactical and operational levels, there are both financial and non-financial indicators. Tactical level financial measurements are mostly cost related. By using the new e-procurement system, total costs of purchases can be easier to monitor since purchasing related information can be stored and found on the system. By knowing total costs, the case company can increase control over purchases. Purchasing price development aims to make some estimations on future purchasing prices and therefore, supports generation of cost savings. Real-time spending versus budget would help to realize current spending and how it is in line with the given budget, hence, giving more control over the spend and increasing budget compliance. Labor cost savings achieved by e-procurement, can be measured as cost savings since manual work can be reduced.

The non-financial measurements at tactical level are important too. Percentage of contract coverage gives some estimation of the control level in the case company because the higher the number of contracts, the higher the possibility for end-users to use suppliers with contracts. Also, maverick-buying ratio is helpful to use measure to internal control and it supports increasing control since end-users can be monitored. E-procurement is able to reduce supplier selection cycle times and in the case company, the benefits of e-procurement could be measured as supply source selection cycle time, which improves process efficiency. Lastly, the new system should be used in almost every category sooner or later and therefore, usage of e-procurement in a specific category could indicate the usage percentage development and how employees have adopted the system in different categories.

At operational level, financial measurements consist of cost per invoice and automated invoice matching ratio. Since the case company identified problems in

invoice processing and probably higher invoicing cycles increase costs of invoices, cost per invoice measurement would support and motivate to adopt practices to strive for lower invoice processing costs. For example, automated invoice matching can reduce invoice processing time and furthermore, reduce cost per invoice. Hence, automated invoice matching ratio could be used to either measure the monetary value of automated invoice matching or it could be possible to measure percentage of automated invoice matching.

Lastly, operational and non-financial measurements consist of indicators related to processing times, payment compliance and other operational activities. The number of errors made in operational tasks, such as in ordering, could be reduced due to e-procurement and therefore, number or percentage of errors indicates how much processes of the case company are improved. Average time of processing purchasing requests and making purchasing orders measure the advantage for managers and end-users since by decreasing these average times, employees are able to use their time better. As earlier indicated, decreased invoice cycle times help to achieve cost savings, which could be measured as amount of payment obligations or payment term compliance, for example. Purchase order cycle time measures efficiency of the e-procurement system and aims to measure the overall time reduction in the whole purchasing process. Also, number or percentage of purchasing orders created through e-procurement indicates the usage of the system among end-users. Finally, delivery times in the case company are not as strict in indirect purchasing as in direct sourcing, however, measuring of delivery time of delayed orders could support finding the benefits of e-procurement if the system is able to decrease delivery times in some categories.

All the earlier proposed measurements are numeric measurements and they can be quantified. However, as some interviewees proposed, also non-numeric measurements are important and although they are harder to measure and quantify, there are some possible measurements that could be used to measure especially the feelings of end-users since as said, they are in an important role to accept the

new e-procurement system. Some other possible measurements, which are not in the introduced tables, could be related to qualitative measuring, for example, measuring satisfaction of employees during the implementation process and after the implementation has ended. For instance, there could be user satisfaction surveys sent end-users, who should be motivated to take the survey by promoting their possibility to have impact on their own working practices. Obviously, the feedback coming from the survey should then really have impact on the current practices and decision-making. The survey should be done twice, at least, in order to see the possible changes in end-users' feelings.

6.2 Measurements for indirect purchasing categories

In this chapter, the earlier introduced measurements are viewed by a more category-based approach and it is examined which kind of measurements could be useful for indirect purchasing categories. However, since these measurements have not been discussed directly with the category managers, there are few indicators proposed for categories, which are going to be moved into the system first: IT and telecom, MRO and engineering services. The category managers are eventually the ones who are implementing and choosing the best indicators for their needs. As earlier, there are both financial and non-financial measurements proposed.

When it comes to categorization in the case company, the main problem is the increasing amount of non-categorized suppliers in most of the categories, which is due to non-compliant buying and lack of internal control as earlier mentioned. Another significant problem is the number of small suppliers. 80 percent of the spend is spent among 105 suppliers and the average spend for these suppliers is around 842 400 euros. The problem is the long tail: the rest 20 percent of spend is divided among 2057 suppliers and the average spend is around 10 760 euros per supplier, and for most suppliers the spend is clearly under the average of 10 760 euros. The measurements for the categories could be designed to address these problems.

In IT and telecom category, there is a total number of 68 suppliers and spend for these suppliers is 2,7 percent of the total spend for all categories, and therefore, this category is one of the smallest categories. As it can be seen in Figure 11, the spend has been divided between several sub-categories and there are both products and services in the category. If new goods are ordered, delivery time of the purchasing could be measured. Also, at least in IT products, there are e-catalogues in the e-procurement system and therefore, number of errors in purchasing process should be reduced and average time of making purchasing orders should be decreased at operational level. Tactical level measures, such as, usage of e-procurement in a specific category and supply source selection cycle time could be improved. At strategic level, for instance, the number of suppliers could be measured since currently there are many suppliers with spend under the average of 10 760 euros and hence, the supply base could be reduced since the majority is suppliers with lower spend.

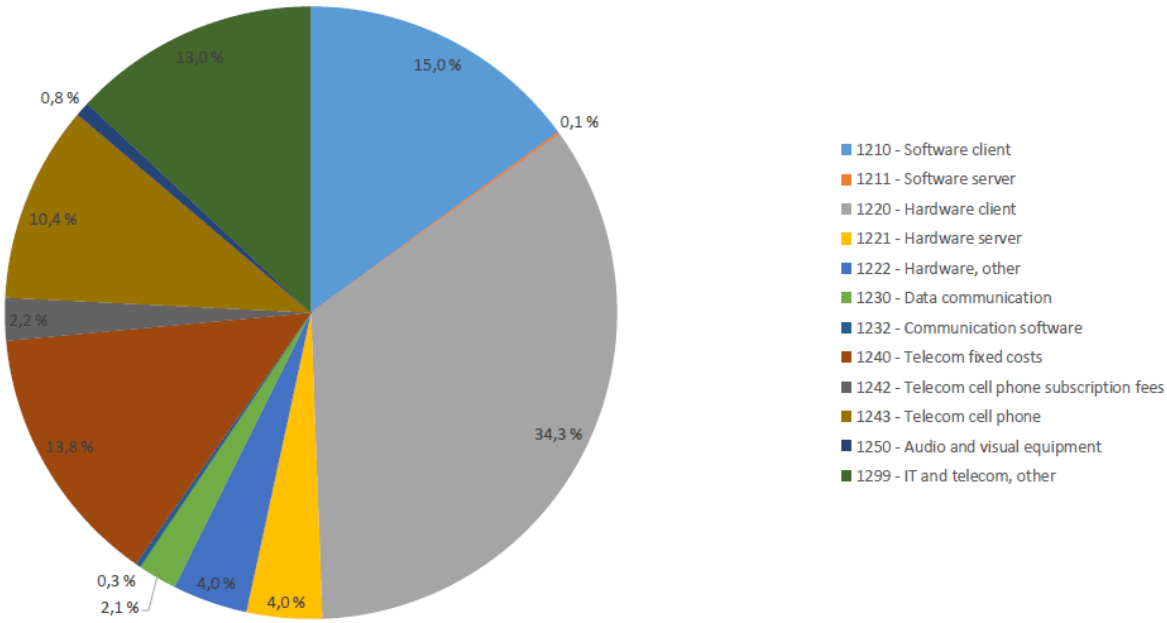

Figure 11. Spend in IT and telecom

In the next category, MRO or maintenance, repair and operations, there are total number of 163 suppliers, which is significantly more than in IT and telecom category. From the total spend 4,2 percentage is spend on MRO category and hence, the category is also on the smaller side. As seen in Figure 12, there are many sub-categories, industrial supplies, hand-tools and personal protection being the most significant ones. In MRO, all the purchased items are products or components, making possible to measure delivery time. However, some sub-categories are maintained by the suppliers, by using vendor-managed inventory, and therefore, those might not be relevant when measuring e-procurement benefits. Other operational level measurements applicable for MRO category could be invoice cycle time, which should be reduced, since there should be less consumer good suppliers due to increased control and hence, the number of payment obligations could be decreased. From tactical level indicators contract coverage and maverick-buying could be especially followed since contract coverage with preferred suppliers should increase due to e-procurement and maverick-buying, on the other hand, decrease. At strategic level, for instance, goods or services with multiple suppliers could be reduced since purchases are focused for the specific supplier.

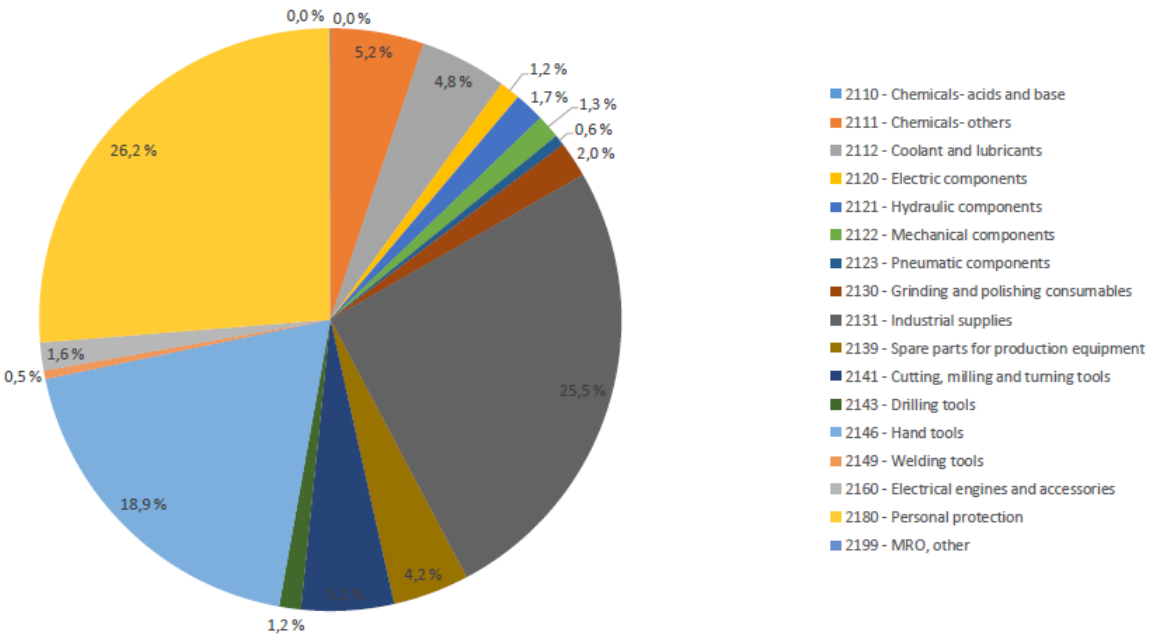

Figure 12. Spend in MRO

Finally, in engineering services, which is actually a sub-category of professional services, there are 56 suppliers. In Figure 13, all the sub-categories of professional services can be seen, however, only engineering service sub-category is firstly taken into use in the e-procurement system. The total spend for professional services is 35,5 percentage, which makes it the largest spend category. Engineering services account for 45,4 percentage of the category spend and it is clearly the largest sub-category. As the name of the category suggests, there is only services in the category, which makes it a very different category to measure compared to MRO, for instance. Operational level indicators suitable for engineering services are a bit more challenging to decide due to intangible nature of services. However, at tactical level total cost of purchases could be measured. Strategic level measurements, such as spend per category could be useful to measure since spend for the category and the number of suppliers could be decreased by buying the services from larger companies and not from many smaller suppliers.

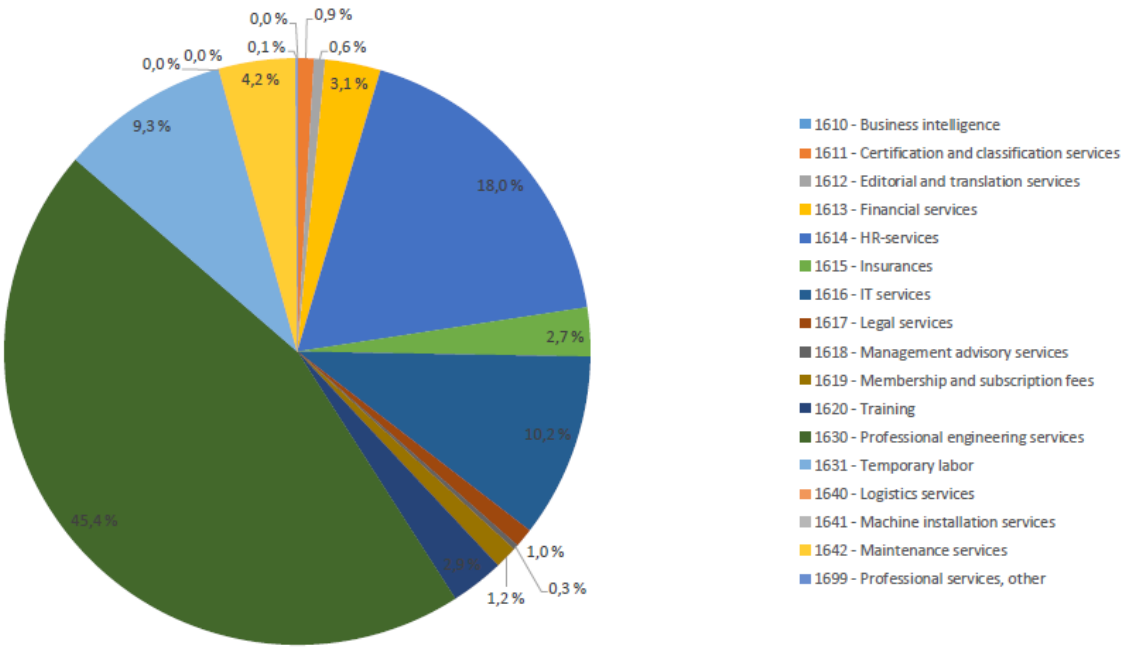

Figure 13. Spend in professional services

7 SUCCESSFUL IMPLEMENTATION OF E-PROCUREMENT SYSTEM

This part handles the implementation success factors and challenges in the case company. The benefits of e-procurement are introduced, which helps to understand what kind of advantages employees are expecting to gain from this project. By introducing these benefits inside the case company and finding the possible barriers, it is more likely to prevent resistance to change and increase acceptance of the implementation among the end-users.

In the implementation process, there are various roles in the core implementation team. For example, there are a project manager who is in charge of indirect procurement in Finland and then there are various stakeholders, such as the closest project team, which has had an enormous significance in the project. The closest project team consists of the purchaser and two category managers. In addition, there are other various stakeholders involved to the project inside the company, such as people who have been a part of project definition team or people included into the testing of the system. Then, there are external stakeholders, such as suppliers and the project team from the system providing software company.

The very first piloting of the implementation of the system has been planned to happen in one of the sites, in Finland. The system has been launched at the end of May. After piloting, the system is planned to be implemented another site in Finland in the beginning of fall. In addition, the plan is to implement the system globally one of the business areas and there are already next implementation countries planned. The first categories, which are going to be moved into the e-procurement system, are IT and telecom, MRO and engineering services, and the other categories, excluding travel and cars, are going to added later into the system. Official information about the implementation is going to be given to the employees at the same when the system goes live, which is planned to happen after the interviews for this research have been held.

7.1 The e-procurement system

The e-procurement system implemented is called as a P2P solution and it is provided by a large multinational software company Basware. The system is based on a web-based platform, which can be accessed by the end-users. There are two main parts in the solution: the first one is about purchasing process and the second part is more related to payment. The purchasing related part has been implemented by the project team in indirect purchasing and the payment related part has been implemented by another department. Purchasing and payment functions are meant to be very closely related and therefore systems should be integrated together. The finance department had earlier chosen this software and therefore, this software was decided to chose instead of other systems for indirect purchasing too. The system has been bought by the case company, however the used platform is hosted and maintained by the system providing supplier.

As said, the e-procurement system is web-based and there are different kinds of add-ons that can be bought to get more functionalities, such strategic sourcing or travel and expense management. However, the case company did not purchase additional modules. The system aims to automate the whole purchase-to-pay process, develop processes, decrease costs, increase cash, release resources for other tasks, improve functions and increase the quality of decision-making. The system has been described as an electronic system for invoice processing which can be used to invoice checking and approval anywhere and anytime since only internet connection is needed. The e-procurement system is promised to be used with different devices, such as working stations, smart phones and tablet computers. Also, it should be possible to communicate with others on the platform.

7.2 The benefits of the e-procurement system

There are many advantages related to the e-procurement, which have been identified by the interviewees. These benefits can be roughly divided into cost savings, improved monitoring and control, faster processing of orders and invoices and more efficient and clear purchasing process, and these are presented in Figure 14. Percentages in the horizontal axel indicate the percentage of respondents mentioning the same benefit. According to the respondents, the most important benefits are improved monitoring and control and more straightforward purchasing process. It can be seen that there are mainly tactical, such as cost savings and internal monitoring and control, and operational level benefits, consisting of faster processing of orders and invoices and more efficient process. However, in the interviews there were few strategic level advantages mentioned, for example, using approved or preferred suppliers and supply base rationalization.

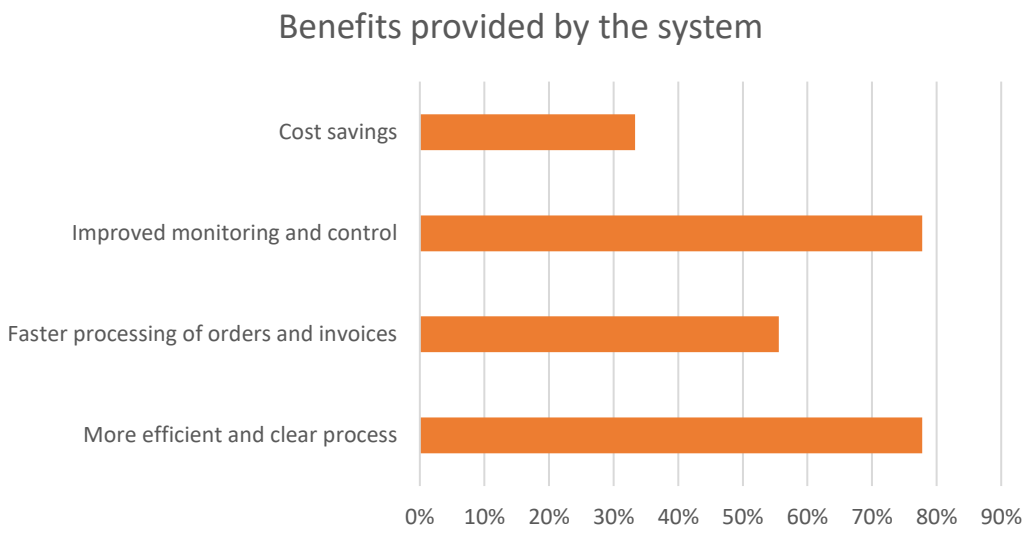

Figure 14. Recognized benefits provided by the system

Cost savings, which have been mentioned to be one of the main targets of implementation, have been identified by the respondents, too. This benefit category includes decreased purchasing prices, budget compliance and control. However,

this category only includes direct cost savings although the other benefits can also indirectly reduce costs. Decreased purchasing prices can be achieved by focusing purchases for fewer suppliers and consolidating purchases. On the other hand, increased internal control, monitoring and reporting through e-procurement can support budgeting and especially budget control. Budget compliance was seen as a challenge in the current process and therefore, implementing e-procurement is useful both from savings point of view and budget compliance point of view.

Lack of internal control and maverick-buying were earlier identified as major challenges to be addressed and almost all interviewees had recognized these challenges. According to the interviews, e-procurement could bring more control and a tool to monitor end-users and prevent misbehavior since purchasing orders are approved instead of approving invoices, which creates forward-looking practices in the company. As one respondent mentioned, it is easier to prevent incompliant practices to happen than to try correct mistakes afterwards, which usually takes a lot of time, and majority of unnecessary purchases can be eliminated. In addition, transparency of purchasing process has been recognized to increase since there are actual purchasing orders which are documented. Documentation also helps to monitor ordering and identify what is really needed since otherwise it can be difficult to know what has been ordered and what should still be ordered.

Faster processing of orders and invoices was seen as a great development since currently, the processes for both invoicing and purchasing were described to be slow and time consuming. When it comes to purchasing orders, for instance catalogues and improved search ability in the system could be helpful to reduce purchasing process time. In addition, since e-procurement is meant to limit the number of suppliers, there are less suppliers to choose from, which should result as faster supplier selection process. On the other hand, the case company has had challenges with invoice processing and although e-procurement cannot eliminate all the problems, the invoice processing can still be made more efficient since there is

no need to approve invoice, and instead of approving and waiting, invoice processing can start right away.

Lastly, more efficient and clear purchasing process has been widely mentioned among the interviewees. Many respondents mentioned that their working time could be used a lot better since due to e-procurement there is less guiding of others in the purchasing process and there are less unclear purchases. Saved time could be used to, for instance, make development plans, focus on the actual work or plan budgeting. E-procurement reduces humane errors in purchasing and invoice processes and also, just electronic processing itself reduces processing time, since there is no need to do as much manual work, such as physically handling papers. According to some respondents, efficiency could be improved by the search capabilities of the system since time is not wasted on looking for suitable products or suppliers. In addition, some earlier mentioned factors, such as faster purchase order processing or invoice processing have been identified to increase efficiency.

Some other benefits were mentioned to be flexibility that e-procurement could provide. As one of the features of the new system is a mobile e-procurement application, the opinions of employees were asked. Majority of the interviewees considered the mobile application as a useful tool, especially during holiday season or if daily tasks do not include lots of sitting in place. Some interviewees have team members who travel a lot and then there are people who need to be in, for instance, production area and are not able sit in front of computer all day and hence, mobile procurement could offer flexibility. However, two major concerns were identified: user interface and the limited memory capacity of mobile phones. The respondents seemed to be eager to use the application in case the usability of the platform is good. Many employees have their mobile phones as a fringe benefit and there are both personal and work-related applications, which can make loading of new applications difficult since there is no room for them. In addition, some interviewees doubt if older employees are able to adopt mobile systems. All in all, possibility to have mobile e-procurement platform was considered to be an advantage.

7.3 Success factors of the implementation project

In this research, awareness of the system was found out by asking if the employee had heard about the system. As Figure 15 illustrates, there was only one employee who was not aware of the system at all, however, when invitations to interviews were sent, there was another person not aware of the system, but he did not participate into interviews. In the category aware, there are many employees who are not very familiar with the project or with the system, but they still have heard about the system and the implementation. Also, in the same category there are people who know a bit more about the project, but they are not involved in the project. The last category consists of employees involved in the project testing group or any other roles in the project. Taking into account that the employees specifically exposed to the implementation, have only been management and the testing group, it could be said that also other employees have been quite aware of the system although some interviewees wanted to emphasize that there has not been enough information provided.

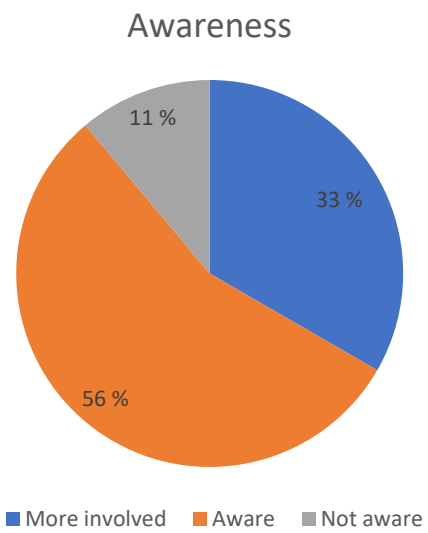

Figure 15. Awareness of the implementation of the system

Before the implementation, feelings towards the new system are quite well distributed between positive, neutral and hesitant, as seen in Figure 16. By positive feelings, it is meant respondents who have overall more positive than negative attitude towards the new system. Often these respondents also recognized lack of control in current practices and they were eager to start to use the system. Neutral feelings refer to indifferent attitude and respondents with neither more positive or more negative feelings. People with neutral feelings had recognized the need for system too, but they did not have more specific feelings towards the system. Lastly, employees with hesitant feelings have a bit more negative attitude towards the system but they still have understanding why the system is needed. These respondents were afraid of bureaucracy and the system making their work more complicated. There is no separate category for negative feelings since hesitant category is replacing it as none of the respondents has completely negative feelings towards the system. Overall, the interviewees seemed to have fairly positive feelings about the implementation.

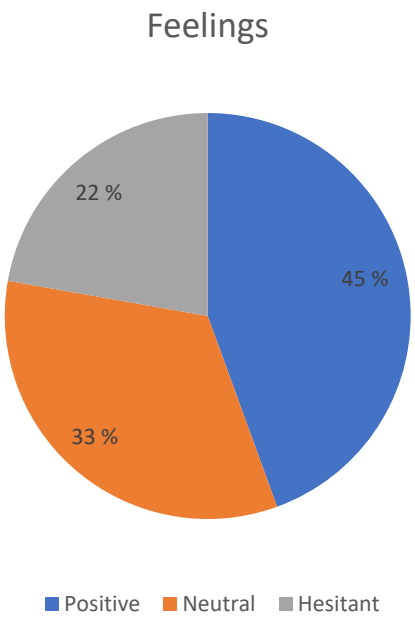

Figure 16. Feelings towards the system

The respondents were asked how they would implement the system in their own teams and which kind of support they would need. Clearly, as Figure 17 illustrates, the most desired way of support is practical training and education. Practical training and education supports “learning by doing” -attitude, which seemed to be widely popular among the respondents and in their plans to implement the system in their teams. In practical training, the employees should be able to practice by themselves real-life situations in supporting environment. Many respondents agreed that these kinds of practices should be arranged for a specific function or department and there should not be too large group sizes. If training is organized by functions, the employees and the trainer can focus on the most relevant functionalities and tasks of the specific function and find the elements of the system, which are the most useful and relevant for the employees to success in their daily work. It was feared that too large groups may prevent people for asking help or asking questions, which are important for the end-users in order to feel supported. For the employees who are not going to work daily or often with the system, larger groups and more general information seemed to be appropriated.

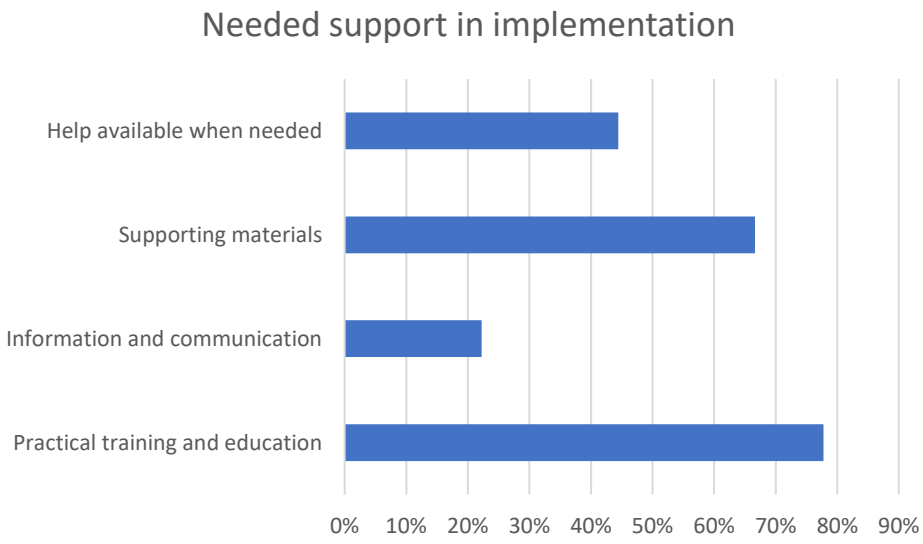

Figure 17. Needed support in deployment of the system

Along with training and education, supporting materials are important, especially for the employees, who are not going to use the system often. Also, it was proposed that the learning and education material could be very useful for new employees who may not be familiar with the system. According to the interviewees, all kinds of materials were perceived to have a positive impact on the acceptance of the system. The materials most discussed were online tutorials and physical step-by-step manuals. Online tutorials could be anything from video tutorials to images and text, although visualization was seen as a helpful element. Online materials could be found on intra, for example, and the access and information of the access could be provided by e-mail. On the other hand, physical step-by-step instruction could be stored near working stations, so that the instructions are on hand when needed. All the instructions should be clear and easy to follow and understand by the end-users and ideally, there would be several types of instructions for different types of end-users.

The respondents also wished that there would be help available in new and challenging situations, and the supporting person should be clearly indicated for the end-users and easy to reach. The planned supporting clinic for the employees seemed to be quite equivalent for this need. The clinic is planned to be provided at specific times and there is a supporting person in place to help users. The clinic is planned to be organized frequently at the beginning of the launch and later according to the needs. Although the clinic got a positive welcome from the respondents, according to the interviews, there should still be immediate help available in working hours and the clinic should not replace practical training and education.

Informing of end-users and communicating with them could be used as supporting factors, too. For example, the earlier mentioned feedback channel or survey for end-users could be used to help two-way communication. However, the best way to get constructive feedback, would not be asking anonymous feedback since the respondents doubted if there would be appropriated and relevant responds due to

end-users' resistance to change. Few respondents saw department meetings as a good way to increase employees' understanding of the system. Also, according to one respondent, indirect purchasing department is mostly responsible to communicate with end-users and to inform them.

When thinking of the success factors for implementation process, the earlier introduced factors seemed to have great role among the interviewees. In addition, another important factor related to implementation has been recognized to be introduction of the benefits for the end-users. Almost all respondents mentioned that the easiest way to implement the system is to introduce concrete advantages for the end-users. As one the respondents described, the system should be good enough to make the end-users wanting to use it. According to this person, the job of the system is to make the end-users to see the benefits and therefore, just telling about the benefits and not demonstrating them is not enough.

Another identified success factors are "learning by doing" -attitude, learning together in teams and centralizing purchasing only for few employees. Mentality to learn while doing was recognized to be in a significant role in the implementation since this would most likely introduce the advantages of the system and therefore, reduce resistance to change. Learning together in teams and helping each other was a popular response and often the persons in a middle management role seemed to be genuinely interested to be a part of the team. Few respondents thought about going to the clinic and to training sessions with their teams. Finally, according to one respondent, the usage of the system would be best to teach only for few users, who would be responsible for the main usage. Hence, there is no need to give extensive training for everyone, duplicate orders can be eliminated and order processing and searching of suppliers would be faster since orders are placed by end-users who do it regularly.

7.4 The greatest barriers in the implementation process

Along the success factors, the most anticipated implementation barriers are important to identify. To identify the most significant challenges in the implementation of the system into the company's practices, the attitudes of interviewed people and the answers to the interview questions are analyzed. The respondents were asked what factors would create the greatest barrier in the implementation process and the answers can be seen summarized below in Figure 18. The main barriers are incomplete system, lack of communication, resistance to change and lack of training and education. The respondents recognized mostly internal challenges but there were some barriers related to the system, too. However, the greatest concern related to the system was incompleteness of the system, meaning that the system is only half-ready when it is meant to take the system into use. Most of the respondents were more concerned about the implementation process than the system itself.

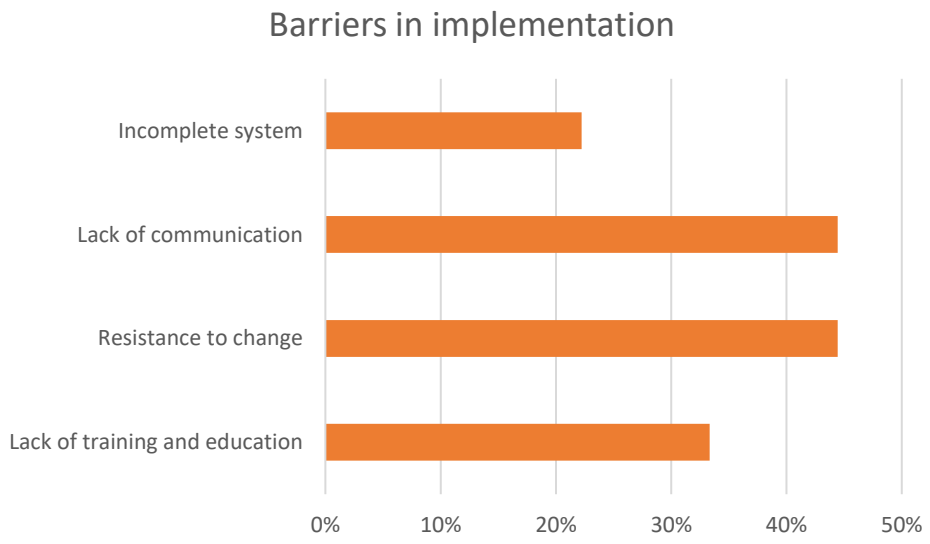

Figure 18. Barriers in implementation process

Lack of communication with employees have been identified among some departments. According to some interviews, in some departments there has been

lack of information and lack of involving the end-users, which have decreased motivation to learn about the new system. Specifically, lack of the earlier mentioned two-way communication between some departments and indirect purchasing department has caused interruptions. Mostly those departments are afraid that their needs are not listened enough, and they lose freedom to choose suppliers. Along with lack of communication, resistance to change was identified as one of the greatest barriers. Some interviewees had already signs of resistance to change in their teams even before starting the implementation. Resistance to change was caused by not wanting to change old working practices or habits, and the system was seen to increase work load and bureaucracy. In addition, some of the respondents were concerned of smaller suppliers and their ability to adopt the new practices, which increases resistance to change. Lastly, learning of new systems was seen unsure since some of the respondents were not sure how the system works. Overall, it seems that all employees have not yet received enough proper information of the positive effects of the system.

Furthermore, the respondents identified lack of training and education as a barrier. As earlier said, training and education were seen crucial for successful implementation and therefore, lack of these activities can decrease the end-users' motivation to use the system if they are not comfortable enough to use it or, in the worst case, they do not even know how to use it. On the other hand, if employees are not trained or educated, the opinions of other people may influence more on individuals and if the general atmosphere is against the system, the employees are likely to turn against the system even if they have not tried the e-procurement system. Lastly, if the employees are not educated or trained, all the benefits of the system cannot be explored or at least, it takes longer for them to explore them. The respondents emphasized the significance of diverse training and hence, the greatest barrier in organizing education or training would be not organizing the sessions according to the needs of employees.

Although there were not many system related barriers recognized, the respondents had some concerns related to the system in general. As seen in Figure 19, the most significant concerns related to the system are bureaucracy, inflexibility, usability and excessive customization. The system was feared to increase bureaucracy and overall complexity of purchasing process since some of the interviewees felt that there are more work and steps to accomplished before purchasing orders can be done. Another significant problem related to the system was considered to be inflexibility. For example, according to many interviews, there are lots of situations which require fast actions and these respondents claimed that they do not have time to use any sort of system to order in urgent situations. Therefore, it was wondered, how the system would suit the needs of the different business units and functions. Another flexibility concern is related to the flexibility to add new suppliers into the system and how this happens in practice. Some of the respondents were afraid that new suppliers cannot be added into the system to replace, for example, suppliers, which are not used anymore. It was wondered too, how the system will work with foreign suppliers which some respondents use a lot.

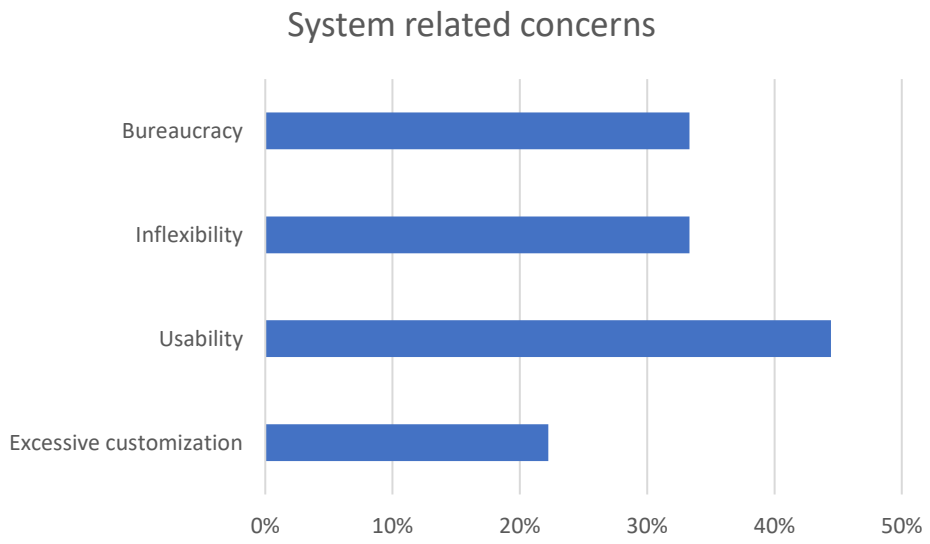

Figure 19. System related concerns

Usability seems to be the greatest concern of the respondents. For example, slowness, hard to find what is needed and not guiding end-users were identified as some of the key problems. Slowness of the system was often related to the loading time of different websites. The structure of the system is important in sense that the clearer the structure is, the easier it is to find all the needed features, which increases usability. Also, if the system guides end-users enough when placing orders, this would help to increase the quality of purchasing orders since there would be less information missing. In addition, few managers emphasized the need for Finnish language on the user interface since for some end-users English language is too challenging. Finally, excessive customization of the system was feared too since that makes the case company very dependent on the system provider that can become costly in the long run. Also, according to some respondents, excessive customization can make the system too complex.

When it comes to the case company's external relationships, it can be seen in Figure 20 that there are all types of impacts expected to be. To start of with the positive ones, it is suggested that the system could be able to clarify purchasing orders, and it would make sure that there are actual purchasing orders made to suppliers, giving certainty to suppliers. Another great improvement is decreased invoice cycle making possible to pay invoices on time, which surely has a positive impact on supplier relationships. On the other hand, majority of the respondents did not see any impact on the relationships since some of them already make orders online and some others have long-term and continuing relationships which are not affected by e-procurement. The employees expecting to have negative impact, mention having smaller, so called one-man-companies, as suppliers and these respondents are afraid of losing these suppliers if the suppliers are not willing to or capable of using the new system. Another concern is related to more creative suppliers, which might not be that comfortable with technology since even e-mails are sometimes too formal. The last problematic supplier group is foreign suppliers and how capable they are to use the system. The respondents who identified negative impacts on supplier relationships, reacted overall more negatively to the implementation project because of the fear of losing relationships with suppliers.

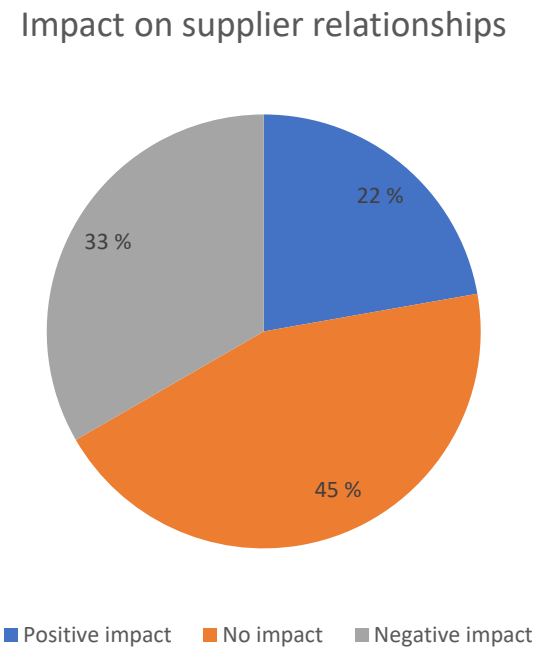

Figure 20. The system's impact on supplier relationships

To combat the possible problems with suppliers, there has been some small initiative communication with them. However, obviously all the suppliers have not been included due to the large supply base and therefore, the focus has been on the most significant suppliers. It is important to plan the communication between the case company and suppliers carefully: which kind of information channel is used and what kind of training or education is planned for them. The project team has a clear plan how to communicate with the suppliers of all sizes: there has been planned to offer, for example, change management training for suppliers, which is aimed to make easier transitioning in supplier companies. The official communication is planned to start in fall.

8 DISCUSSION AND CONCLUSIONS

The main objective of this study was to find out how an e-procurement system can be successfully implemented for indirect purchasing. In addition, it was studied how the benefits received from the system can be measured and how e-procurement supports risk management. The research was a qualitative case study and hence, the organization, practices and processes of the case company were examined. People participated to the interviews were therefore employees of the case company. Overall, the research project took around four months including researching of academic literature, research interviews, empirical analysis and discussion and conclusions.

In this last part of the study, the earlier introduced empirical results are discussed based on the theoretical background and the research questions presented in the introduction chapter are answered. The research is concluded by shortly summarizing the main points of the research. Lastly, there are some recommendations given and suggestions for further research are shortly introduced and discussed.

8.1 Discussion of results

As earlier literature was studied, it was quickly found out that e-procurement implementation has been a popular topic in direct purchasing field. However, when it comes to indirect purchasing, academic literature was not as comprehensive as in direct sourcing. Therefore, it could be said that the development of indirect purchasing is lacking behind direct sourcing and the topic seemed to be especially new in the context of construction and mining industry.

To finally answer the main research question, the sub-questions are first discussed. There were totally four research questions: the main research question and three

sub-questions. The objective of the first sub-question was to find the benefits that can be achieved by implementing the system in the case company. Then it was developed suitable indicators to measure the benefits. The first sub-question was:

"How to measure the benefits achieved by using the e-procurement system?"

There are many benefits identified in literature when implementing an e-procurement system into an organization. The possibilities to categorize these benefits are nearly endless and for instance, some popular ways are financial performance versus operational performance (Ronchi et al., 2010), using organizational boundary and performance hierarchy (Tai et al., 2010), and strategic, tactic and operational (Piotrowicz & Irani, 2010). In this research the classification of strategic, tactic and operational was used.

When it comes to the interviews, it was found out that in the case company, there were similar benefits expected: cost savings, improved monitoring and control, faster processing of orders and invoices, and more efficient and clear overall process. For instance, e-procurement has been reported to reduce maverick-buying between 40 and 30 percentage (Cuganesan & Lee, 2006), the case company could possibly achieve similar kind of numbers. Furthermore, automated invoice matching has been seen to improve match rates to 98 percentage and reducing labor hours related to the process 61 percentage (Grant & Engdahl, 2003). Compared to the overall objectives of the implementation, the benefits expected by the interviewees are more related to tactical and operational levels. However, this might be explained by the positions of the interviewees since majority of them is working at tactical level. All in all, the respondents were able to identify many types of benefits even though only minority of them was very familiar with the system.

To follow the development of these benefits, there needs to be measurements in place. In addition, measuring allows to detect insufficient performance (Förstl et al.,

2013) In e-procurement performance measurement, there are five supporting factors: understanding of objectives and goals and then measuring the performance against those, identifying performance indicators, aligning rewards with performance evaluation and encouraging the stakeholders to increase performance (Panda & Sahu, 2012). Similar to the categorization of the benefits, measurements for e-procurement performance can be categorized many ways, such as, financial versus operational (Kern et al., 2011) and financial versus non-financial (Ishaq Bhatti et al., 2014). This research uses the earlier mentioned strategic, tactic and operational categorization for indicators and in addition, in those categories the measurements are further divided to either financial or non-financial measurements.

For the case company, the final set of KPIs was determined as a result of combining indicators found from the interviews and literature that aim to support especially indirect purchasing categories. In the final set, there are measurements for each benefit mentioned earlier and there are units determined for each measurement. However, there are no measurements identified for strategic and financial performance due to intangible nature of strategic level and the difficulty to turn strategic level benefits as financial measurements. The measurements the respondents proposed in the interviews were similar to the measurements identified on literature, although the respondents were a bit more focused on tactical and operational levels. Also, there are some measurements suggested for specific indirect purchasing categories which are going to be added to the system first: IT and telecom, MRO and professional services. These measurements are based on Table 5 but there are arguments to explain why some measurement would be fitting into a specific category.

The aim of the second sub-question was to find out helpful ways and practice to successfully get the e-procurement system implemented into the case company. Also, factors impacting on the adoption of e-procurement were identified. Hence, the second sub-question was:

"How to successfully manage change in e-procurement implementation process?"

The success factors of e-procurement implementation consist of end-user acceptance, organizational characteristics and external factors. End-user acceptance have a vital role (Brandon-Jones & Kauppi, 2018) since by earning the acceptance is likely to increase the probability of reuse the system (Croom & Johnston, 2003). Organizational characteristics, such as top management support and organization's ability to learn increase successful implementation (Wu et al., 2007). Lastly, when it comes to external factors, issues, such as, participation of suppliers and the system vendor are needed in the implementation process. On the other hand, the barriers for successful implementation include resistance to change, internal challenges and external barriers. Resistance to change refers to employees' resistance to change current practices (Ronchi et al., 2010). Internal challenges are related to organizational culture, such as lack of leadership or lack of information quality (Toktaş-Palut et al., 2014). Lastly, external barriers are caused by non-internal factors, such as system (Costa et al., 2013) or vendor related problems (Angeles & Navi, 2007).

As Purchase & Dooley propose (2010), the case company has communicated the positive impact of the e-procurement system inside the organization in order to increase the end-users' willingness to adopt the system. According to the interviews, the end-users' acceptance might still not have been completely earned yet, at least at operational level. However, the attitudes of the end-users may be difficult to change before they use the system by themselves, but the acceptance can be tried to achieve by emphasizing the benefits received by the end-users, such as faster purchase order processing. Also, general communication and involving of the employees were seen as good practices to increase acceptance and decrease the possibility to see the whole system as a forced and complex process and hence, leading to increased resistance to change. Furthermore, education and training were recognized as ways to decrease resistance to change. Interestingly, according to Brandon-Jones and Kauppi (2018), training and education do not seem to have

significant impact on end-user acceptance. Therefore, the results of this research are conflicting with Brandon-Jones and Kauppi's (2018) study since in the case company there is clearly need for education and training.

On the other hand, the organizational factors of the case company seemed to be quite suitable for the implementation. Top management support has been clearly received by the indirect purchasing department and the implementation project since after the implementation the plan is to really start using the system and therefore, maverick-buying will not be seen appropriated and the individuals trying to pass the system are made to justify their actions for management. Ability to learn should be also good enough since there are already different kinds of IT systems in place and in addition, the middle management has a good understanding why the system is needed and implemented, which increases willingness and motivation to introduce the system in their teams. Some managers are provided with change management training to increase their leadership skills. According to the respondents, lack of information quality might be currently the greatest barrier since some interviewees reported lack of knowledge of the whole system. However, there had not been any official information given to the employees before the interviews were held for this research since the official information events had been planned to start at the same when the system goes live, which was after the interviews were held.

Finally, external factors or barriers have not been forgot in the case company either: in order to increase suppliers' participations there is going to be organized change management training for suppliers, too, and there have been close co-operation with the system provider. However, it is not completely clear how all the suppliers are capable to work in the new electronic environment. When it comes to the system provider, there has been some unexpected issues with the provider, although the selection of the provider has been done carefully. The launching of the system was delayed since there were problems in the integration with the accounts payable

solution, which might not have increased the credibility of the system from the end-user point of view.

The third and last sub-question pondered different ways to increase management of the P2P process and the current risks were identified in order to find e-procurement practices that can support risk avoidance. Therefore, the last sub-question was:

"How to better manage purchase-to-pay process and avoid risks by using e-procurement?"

Purchasing processes usually include the next steps at some level: determining specification, selecting supplier, contracting, ordering, expediting and evaluation and follow-up and evaluation (van Weele, 2014). When it comes to P2P process, at the end of the regular purchasing process, there is added settlement and payment phase (Trkman & McCormack, 2010). Furthermore, if traditional purchasing cycle and e-procurement purchasing cycle are compared, it can be clearly noticed that there are less steps in the e-procurement one (van Weele, 2002). For instance, purchasing orders need to be usually approved before ordering and therefore, there is no need to approve invoices after purchase orders have been received. In addition, another great improvement is that instead of manual invoice matching, there is automated invoice matching.

Before starting the e-procurement implementation process, there were some main problems identified in indirect purchasing inside the case company in order to find out the most critical issues that the e-procurement should address. These main problems consist of budget compliance, process efficiency, risk and control, supplier code of conduct compliance and savings. Comparing the risks identified by the interviewed employees and the previously told problems, there are many same risks recognized: inefficient purchasing process, inflexibility, lack of internal control and

supply base related risks. This can be seen as a good sign since the majority of employees are clearly familiar with these risks.

It seems that the system is able to overall improve efficiency and managing of purchasing process: searching of suppliers is faster, there is less labor fixed to purchasing process, monitoring and controlling of end-users is possible in every stage of purchasing processes, end-users can be guided to use approved or preferred suppliers, faster ordering and less manual work, to mention a few. Also, risks, such as lack of internal control can be easier to manage and avoid by using e-procurement system. In addition, supply base related risks, such as usage of non-approved suppliers or large supply base in indirect purchasing, can be decreased by using e-procurement system, as the system makes possible to monitor purchases. Lastly, inflexibility related risks can be reduced at some level, too, because, for instance, reaction speed and decision-making can be increased due to real-time information and data that are continuosly available.

As the sub-questions have been answered, the main research question can be finally answered. The main question aims to conclude all the earlier results and findings and answer to the objective of the research. The main research question was:

“What kind of factors should be considered to successfully implement an e-procurement for indirect purchasing?”

Successful implementation of an e-procurement system requires at least three types of elements: finding the benefits of the system for the company, measuring of the benefits and managing change. However, the reasons for the implementation are needed to know and the current process is essential to figure out before implementing the system. Also, the company itself and its employees are not the only ones who are going to affected by the system: suppliers, at least, are directly

impacted on the decision to implement the system and there can be various other stakeholders included to the implementation, such as the system providing vendor.

Based on the interviews, the most significant current risks in the indirect purchasing process are inefficient purchasing process, inflexibility, lack of internal control and supply base related risks. On other words, in the implementation process, these are the most important issues that should be tried to be solved by the usage of e-procurement. The identified benefits of the e-procurement system are also closely related to the earlier mentioned risks since the case company is basically able to gain advantages whenever the e-procurement system is able to decrease the identified risks. The most important benefits found on the interviews are cost savings, improved monitoring and controlling, faster processing of orders and invoices and more efficient and clear purchasing process.

Development of the purchasing process can be more difficult to see if there are no measurements in place. The proposed measurements are categorized according to strategic, tactical and operational level and in addition, there are both financial and non-financial measurements in all levels. Basically, all the proposed indicators should be at some level to be applied to the earlier introduced categories of indirect purchasing. However, one fundamental of measuring is to not to apply enormous amounts of indicators but to choose few the most relevant ones per category, which has been planned to do in the case company. The different nature of indirect purchasing can be seen when selecting appropriated measurement: efficiency of the purchasing department is challenging to measure and the purchased goods and services can be very different from each other.

Lastly, successful implementation of an e-procurement system is depended on the next factors at least: leadership, adoption on organizational level, acceptance on individual level and external factors impacting on the implementation. In the case company, they wanted to focus on the change management of the project and therefore, there has been organized suitable training related to leadership and

change management in order to react to the possible challenges. Also, adoption on organizational level has been quite successful since top management seems to be commitment to the implementation and the organization has good abilities to learn since the aim of the system is clear for middle management. However, the acceptance on individual and operational level is lacking motivation since there has not been yet enough positive information and benefits introduced for them.

8.2 Conclusions of the research

Electronic purchasing systems have been realized to give several types of advantages, such as process efficiency, and cost and time savings. However, the attention of management and academics has not been focused on indirect procurement as much as direct sourcing due to its non-direct impact on manufacturing. Lately, the need to control indirect purchasing has emerged and companies try to find ways to implement successfully e-procurement system for indirect procurement. This might be easier said than done since there are many success factors and barriers that should be considered before, during and after the implementation process.

Based on the literature, there were initial benefits of e-procurement and measurements for e-procurement identified. After the interviews, in which the current risks of the purchasing process were identified, the earlier found benefits and measurements were modified and confirmed. It was found that the most significant benefits of e-procurement in indirect purchasing are increased internal control, cost savings, faster processing of orders and invoices and more efficient overall process. These benefits could be measured by using both financial and non-financial indicators in different organizational levels: strategic, tactic and operational. Also, it was found to be useful to have category specific measurements for different indirect purchasing categories.

However, recognizing benefits and measuring them is not enough and therefore, change management is needed in the implementation process, too. Based on the interviews, it was found out that the greatest success factor in the implementation process is the acceptance of the end-users, which can be achieved by providing education and training, supporting materials, information and communication, and give help when needed. On the other hand, the most significant barrier is resistance to change: this can be caused by lack of communication, implementation of incomplete system or lack of training and education.

8.3 Recommendations for the case company

Since the awareness related to the system was quite good when asked from the employees, there was a good starting point for the implementation. However, the employees not aware of the system at all or the employees with less knowledge, had more skeptical attitude towards the system. Therefore, attention could be paid to have plenty of information available in order to decrease skeptical attitude in the organization. Also, it should be ensured that there are enough employees included from different departments to help to recognize the needs of the different departments. In addition, the concern of the current suppliers seemed to be the most important barrier for few employees and hence, it should be ensured that all the suppliers are communicated enough. This could probably decrease the hesitant attitude towards the system since the possible negative effective to supplier relationships could be minimized. Furthermore, coordination inside the case company and with the system provider could be emphasized even further to avoid unexpected situations, such as occurred in the launching day. Since there were two implementation projects at the same time related to each other, one possibility could have been hiring a shared project manager who could have make sure that the projects match with each other.

Also, as earlier said, in the case company, there are totally ten main categories in indirect purchasing, which are divided according to the characteristics of the

purchased goods or services. Measurement of these categories could be done by choosing a set of potential measurements for each category according to the needs of each category. On the other hand, in case the case company would like to have more similar indicators for the categories, another possibility could be using category management models introduced in theoretical part and to create few larger groups that could use similar kind of measurements. However, it is not smart to implement all the proposed KPIs since implementing of the measurement is just starting and the case company should be able to follow all the measurements properly, which is not possible if there are too many indicators.

Another measurement related recommendation is to, in addition to, concrete benefit measurement, measure the feelings and attitudes of the employees before, during and after the implementation. Since the end-users are after all in the most significant role when it comes to the acceptance, measuring of feelings could help to recognize if there is something to improve in the system or in the process. The survey could be very simple and fast to fill-in, and it could be executed as a survey that could be shared by using e-mails, for instance. Also, all types of education, training and supporting materials all wanted. However, the most effective training method could be practical training focusing on a specific department.

8.4 Suggestions for further research

Since this research only identified success factors and barriers for e-procurement implementation in indirect purchasing, in the future it would be interesting to see researches, in which an e-procurement system has been implemented, the system has been measured and finally the actualized benefits of e-procurement have been found out in indirect purchasing. Also, currently academic literature seems to lack in terms of change management and leadership in procurement. Therefore, more could be studied the impact of change management and leadership on the implementation process of e-procurement in indirect purchasing.

Additionally, since indirect procurement combined with the implementation of an e-procurement system is not overly research, this type of research could be easily done in different industries and study if there are any differences between different industries in implementation practices. The significance of different cultures would be interesting to research, too, since it can have impact on the implementation process and practices and acceptance of end-users. Finally, since this research does not take into account suppliers' point of view that could be researched also, as noticed in this research, suppliers and their participation are important factors for successful implementation.

Final and perhaps one of the most interesting future research target could be assessing the industry 3.0 or even further, industry 4.0 readiness. Indirect purchasing departments have taken their first steps in the world of digitalization and automation due the implementation projects of e-procurement systems, which is already a good beginning to start developing the processes even further. Hence, an assessing framework could be used to study the selected case companies and where they are before the introduction of the e-procurement system and where the case companies are after the introduction of e-procurement in technology adoption. In the maturity profile, there could be seven layers consisting of strategy, process, P2P, controlling, sourcing, suppliers and employees, which could be used to estimate how well these layers are able to adopt the usage of IT systems and automation.

REFERENCES

Abdel-Maksoud, A., Dugdale, D. & Luther, R. (2005) Non-financial performance measurement in manufacturing companies. *The British Accounting Review* 37(3), 261-297.

Abolbashari, M. H., Chang, E., Hussain, O. K. & Saberi, M. (2018) Smart Buyer: A Bayesian Network modelling approach for measuring and improving procurement performance in organisations. *Knowledge-Based Systems* 142(1), 127-148.

Angeles, R. & Nath, R. (2007) Business-to-business e-procurement: Success factors and challenges to implementation. *Supply Chain Management: An International Journal* 12(2), 104-115.

Ash, C. G. & Burn, J. M. (2006) Evaluating Benefits of e-Procurement in a B2B Marketplace: A case study of Quadrem. *Journal of Information Technology Case and Application Research* 8(2), 5-23.

Ateş, M. A., Wynstra, F. & van Raaij, E. (2015) An exploratory analysis of the relationship between purchase category strategies and supply base structure. *Journal of Purchasing and Supply Management* 21(3), 204-219.

Ateş, M., van Raaij, E. & Wynstra, F. (2018) The impact of purchasing strategy-structure (mis)fit on purchasing cost and innovation performance. *Journal of Purchasing and Supply Management* 24(1), 68-82.

Bai, C. & Sarkis, J. (2014) Determining and applying sustainable supplier key performance indicators. *Supply Chain Management: An International Journal* 19(3), 275-291.

Baier, C., Hartmann, E. & Moser, R. (2008) Strategic alignment and purchasing efficacy: an exploratory analysis of their impact on financial performance. *Journal of Supply Chain Management* 44(4), 36-52.

Baron, J., Shaw, M. & Bailey, A. (2000) Web-based e-catalog systems in B2B procurement. *Communications of the ACM* 43(5), 93-100.

Bartezzaghi, E. & Ronchi, S. (2005) E-sourcing in a buyer-operator-seller perspective: Benefits and criticalities. *Production Planning & Control* 16(4), 405-412.

Benslimane, Y., Cysneiros, L. & Bahli, B. (2007) Assessing critical functional and non-functional requirements for web-based procurement systems: A comprehensive survey. *Requirements Engineering* 12(3), 191-198.

Bottani, E. & Rizzi, A. (2005) A fuzzy multi-attribute framework for supplier selection in an e-procurement environment. *International Journal of Logistics Research and Applications* 8(3), 249-266.

Brandon-Jones, A. (2017) E-procurement quality from an internal customer perspective Construct development, refinement, and replication using a mixed-methods approach. *International Journal of Operations & Production Management* 37(12), 1741-1772.

Brandon-Jones, A. & Carey, S. (2011) The impact of user-perceived e-procurement quality on system and contract compliance. *International Journal of Operations & Production Management* 31(3), 274-296.

Brandon-Jones, A. & Kauppi, K. (2018) Examining the antecedents of the technology acceptance model within e-procurement. *International Journal of Operations & Production Management* 38(1), 22-42.

Bromberg, D. & Manoharan, A. (2015) E-procurement implementation in the united states: understanding progress in local government. *Public Administration Quarterly* 39(3), 360-392.

Caniato, F., Luzzini, D. & Ronchi, S. (2014) Purchasing performance management systems: An empirical investigation. *Production Planning & Control* 25(7), 616-635.

Carmines, E. G. & Zeller, R. A. (1979) Reliability and validity assessment. London, SAGE.

Carr, A. S. & Pearson, J. (2002) The impact of purchasing and supplier involvement on strategic purchasing and its impact on firm's performance. *International Journal of Operations & Production Management* 22(9), 1032-1053.

Chang, Y., Markatsoris, H. & Richards, H. (2004) Design and implementation of an e-Procurement system. *Production Planning & Control* 15(7), 634-646.

Chao, C., Scheuing, E. & Ruch, W. (1993) Purchasing performance evaluation: An investigation of different perspectives. *International Journal of Purchasing and Materials Management* 29(3), 33-39.

Chomchaiya, S. & Esichaikul, V. (2016) Consolidated performance measurement framework for government e-procurement focusing on internal stakeholders. *Information Technology & People* 29(2), 354-380.

Costa, A., Arantes, A. & Valadares Tavares, L. (2013) Evidence of the impacts of public e-procurement: The Portuguese experience. *Journal of Purchasing and Supply Management* 19(4), 238-246.

Cox, A. (2015) Sourcing portfolio analysis and power positioning: Towards a “paradigm shift” in category management and strategic sourcing. *Supply Chain Management: An International Journal* 20(6), 717-736.

Croom, S. R. (2000) The Impact of Web-Based Procurement on the Management of Operating Resources Supply. *Journal of Supply Chain Management* 36(4), 4-13.

Croom, S. & Johnston, R. (2003) E-service: Enhancing internal customer service through e-procurement. *International Journal of Service Industry Management* 14(5), 539-555.

Cuganesan, S. & Lee, R. (2006) Intra-organisational influences in procurement networks controls: The impacts of information technology. *Management Accounting Research* 17(2), 141-170.

Dai, R., Narasimhan, S. & Wu, D. (2005) Buyer's Efficient E-Sourcing Structure: Centralize or Decentralize? *Journal of Management Information Systems* 22(2), 141-164.

Dai, Q. & Kauffman, R. (2006) To be or not to B2B: Evaluating Managerial Choices for e-Procurement Channel Adoption. *Information Technology and Management* 7(2), 109–130.

Davis, F. D. (1989) Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly* 13(3), 319-340.

Davis, F. D., Bagozzi, R. P. & Watshaw, P. R. (1989) User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science* 35(8), 982-1003.

Deloitte (2018) Tracking the trends 2018. [www document]. [Accessed 25 May 2018]. Available http://www.mining.com/wp-content/uploads/2018/01/Deloitte-Tracking-the-Trends-Global-Mining-Study-FINAL.pdf?kui=rzrUq_cVzFSMfpMQ8K4YFw#_ts=1519224874780

Dumond, E. (1994) Making Best Use of Performance Measures and Information. *International Journal of Operations & Production Management* 14(9), 16-31.

Dunlap, S. (2005) The Last Unautomated Frontier: How Technology Is Streamlining The Invoice-To-Cash Process. *AFP Exchange* Jan/Feb, 14-17.

de Boer, L., Labro, E. & Morlacchi, P. (2001) A review of methods supporting supplier selection. *European Journal of Purchasing and Supply Management* 7(2), 75-89.

de Boer, L., Harink, J. & Heijboer, G. (2002) A conceptual model for assessing the impact of electronic procurement. *European Journal of Purchasing and Supply Management* 8(1), 25-33.

de Boer, L., Holmen, E. & Pop Sitar, C. (2003) Purchasing as an organizational design problem: The case of non-product-related items and services. *Management Decision* 41(9), 911-922.

Devaraj, S., Krajewski, L. & Wei, J. (2007) Impact of eBusiness technologies on operational performance: The role of production information integration in the supply chain. *Journal of Operations Management* 25(6), 1199-1216.

Easton, G. (2010) Critical realism in case study research. *Industrial Marketing Management* 39(1), 118-128.

Easton, L., Murphy, D. & Pearson, J. (2002) Purchasing performance evaluation: With data envelopment analysis. *European Journal of Purchasing and Supply Management* 8(3), 123-134.

European Commission (2018) Minerals and non-energy extractive industries. [www document]. [Accessed 25 May 2018]. Available https://ec.europa.eu/growth/sectors/raw-materials/industries/minerals_en

Förstl, K., Hartmann, E., Wynstra, F. & Moser, R. (2013) Cross-functional integration and functional coordination in purchasing and supply management. *International Journal of Operations & Production Management* 33(6), 689-721.

Gangurde, S. & Chavan, A. (2016) Benchmarking of purchasing practices using Kraljic approach. *Benchmarking: An International Journal* 23(7), 1751-1779.

Gardenal, F. (2013) A model to measure e-procurement impacts on organizational performance. *Journal of Public Procurement* 13(2), 215-242.

Gebauer, J. & Segev, A. (2000) Emerging technologies to support indirect procurement: Two case studies from the petroleum industry. *Information Technology and Management* 1(1), 107-128.

Gebauer, J. & Shaw, M. (2004) Success Factors and Impacts of Mobile Business Applications: Results from a Mobile e-Procurement Study. *International Journal of Electronic Commerce* 8(3), 19-41.

Gelderman, C. J. & van Weele, A. J. (2003) Handling measurement issues and strategic directions in Kraljic's purchasing portfolio model. *Journal of Purchasing and Supply Management* 9(5), 207-216.

Ghalayini, A. M. & Noble, J. S. (1996) The changing basis of performance measurement. *International Journal of Operations & Production Management* 16(8), 63-80.

Gill, R. (2002) Change management--or change leadership? *Journal of Change Management* 3(4), 307-318.

Gilley, A., Gilley, J. & McMillan, H. (2009) Organizational change: Motivation, communication, and leadership effectiveness. *Performance Improvement Quarterly* 21(4), 75-94.

González-Benito, J. (2007) A theory of purchasing's contribution to business performance. *Journal of Operations Management* 25(4), 901-917.

Grant, M. & Engdahl, S. (2003) Flipping the e-commerce switch: Five steps to payments automation. *AFP Exchange* 23(3), 68-71.

Griffith-Cooper, B. & King, K. (2007) The partnership between project management and organizational change: Integrating change management with change leadership. *Performance Improvement* 46(1), 14-20.

Gunasekaran, A., McGaughey, R.E., Ngai, E.W.T. & Rai, B.K. (2009) E-Procurement adoption in the Southcoast SMEs. *International Journal of Production Economics* 122(1), 161-175.

Gunasekaran, A. & Ngai, E.W.T. (2008) Adoption of e-procurement in Hong Kong: An empirical research. *International Journal of Production Economics* 113(1), 159-175.

Gunasekaran, A., Patel, C. & Tirtiroglu, E. (2001) Performance measures and metrics in a supply chain environment. *International Journal of Operations & Production Management* 21(1/2), 71-87.

Gurtner, S., Reinhardt, R. & Soyez, K. (2014) Designing mobile business applications for different age groups. *Technological Forecasting & Social Change* 88(1), 177-188.

Hadeler, B. & Evans, J. (1994) Supply strategy: Capturing the value. *Industrial Management* 36(4), 3-4.

Hawking, P., Stein, A., Wyld, D. & Foster, S. (2004) E-procurement: Is the ugly duckling actually a swan down under? *Asia Pacific Journal of Marketing and Logistics* 16(1), 3-26.

Hemsworth, D., Sánchez-Rodríguez, C. & Bidgood, B. (2005) Determining the impact of quality management practices and purchasing-related information systems on purchasing performance. *Journal of Enterprise Information Management* 18(2), 169-194.

Hung, W., Lin, C., Tai, Y., Ho, C. & Jou, J. (2014) Exploring the impact of Web-based e-procurement on performance: Organisational, interorganisational, and systems perspectives. *International Journal of Logistics Research and Applications* 17(3), 200-215.

Irani, Z. & Love, P. (2002) Developing a frame of reference for ex-ante IT/IS investment evaluation. *European Journal of Information Systems* 11(1), 74-82.

Ishaq Bhatti, M., Awan, H. & Razaq, Z. (2014) The key performance indicators (KPIs) and their impact on overall organizational performance. *Quality & Quantity* 48(6), 3127-3143.

Janda, S. & Seshadri, S. (2001) The influence of purchasing strategies on performance. *Journal of Business & Industrial Marketing* 16(4), 294-308.

Johnson, M. (2010) Barriers to innovation adoption: A study of e-markets. *Industrial Management & Data Systems* 110(2), 157-174.

Kakouris, A. P., Polychronopoulos, G. & Binioris, S. (2006) Outsourcing decisions and the purchasing process: A systems-oriented approach. *Marketing Intelligence & Planning* 24(7), 708-729.

Karjalainen, K., Kemppainen, K. & Raaij, E. (2009) Non-Compliant Work Behaviour in Purchasing: An Exploration of Reasons Behind Maverick Buying. *Journal of Business Ethics* 85(2), 245-261.

Kaskinen, J. (2007) Creating a Best-in-Class KPI Program. *Strategic Finance* 89(4), 29-33.

Kauppi, K., Brandon-Jones, A., Ronchi, S. & Raaij, E. (2013) Tools without skills: Exploring the moderating effect of absorptive capacity on the relationship between e-purchasing tools and category performance. *International Journal of Operations and Production Management* 33(7), 828-857.

Kern, D., Moser, R, Sundaresan, N. & Hartmann, E. (2011) Purchasing Competence: A Stakeholder-Based Framework for Chief Purchasing Officers. *Journal of Business Logistics* 32(2), 122-138.

Khan, A. & Pillania, R. (2008) Strategic sourcing for supply chain agility and firms' performance. *Management Decision* 46(10), 1508-1530.

Kim, J. & Shunk, D.L. (2004) Matching indirect procurement process with different B2B e-procurement systems. *Computers in Industry* 53(2), 153-164.

Kim, M., Suresh, N. & Kocabasoglu-Hillmer, C. (2015) A contextual analysis of the impact of strategic sourcing and E-procurement on performance. *Journal of Business & Industrial Marketing* 30(1), 1-16.

Kite, C. & Fletcher-MacDonald, T. (1999) Keeping implementation costs low: Research is the key to managing costs when implementing Web-based procurement. *InfoWorld* 21(29), 66-.

Knudsen, D. (2003) Aligning corporate strategy, procurement strategy and e-procurement tools. *International Journal of Physical Distribution & Logistics Management* 33(8), 720-734.

Kothari, T., Hu, C. & Roehl, W. (2005) e-Procurement: An emerging tool for the hotel supply chain management. *International Journal of Hospitality Management* 24(3), 369-389.

Koubaa, Y. (2016) An empirical illustration of the transformation process of purchasing. *The International Journal of Logistics Management* 27(1), 167-187.

Kraljic, P. (1983) Purchasing must become supply management. *Harvard Business Review* 61(5), 109-117.

Kumar, A., Ozdamar, L. & Peng Ng, C. (2005) Procurement performance measurement system in the health care industry. *International Journal of Health Care Quality Assurance* 18(2), 152-166.

Kwon, S., Yang, H. & Rowley, C. (2009) The Purchasing Performance of Organizations Using e-Marketplaces. *British Journal of Management* 20(1), 106-124.

Leeds, R. (2016) Top 4 Challenges Facing The Construction Industry. [www document]. [Accessed 24 June 2018]. Available http://www.digitalistmag.com/future-of-work/2016/08/15/top-4-challenges-facing-construction-industry-04388065

Legner, C., Urbach, N. & Nolte, C. (2016) Mobile business application for service and maintenance processes: Using ex post evaluation by end-users as input for iterative design. *Information & Management* 53(6), 817-831.

Markus, M. L. (2004) Technochange management: Using IT to drive organizational change. *Journal of Information Technology* 19(1), 4-20.

Meekings, A. (2005) Effective review meetings: The counter-intuitive key to successful performance measurement. *International Journal of Productivity and Performance Management* 54(3), 212-220.

Melnyk, S., Stewart, D. & Swink, M. (2004) Metrics and performance measurement in operations management: Dealing with the metrics maze. *Journal of Operations Management* 22(3), 209-218.

Michaelides, Z., Ho, J., Boughton, N. & Kehoe, D. (2003) The development and evaluation of Internet-based supply of non-production (MRO) items. *International Journal of Logistics Research and Applications* 6(4), 319-332.

Muchiri, P. N., Pintelon, L., Martin, H. & De Meyer, A-M. (2010) Empirical analysis of maintenance performance measurement in Belgian industries. *International Journal of Production Research* 48(20), 5905-5924.

Mukhopadhyay, T. & Kekre, S. (2002) Strategic and Operational Benefits of Electronic Integration in B2B Procurement Processes. *Management Science* 48(10), 1301-1313.

Murphy, C. (2012) Electronic invoice authorization – providing the foundation for an efficient accounts payable department. *Credit Control* 33(2), 80-85.

Nair, A., Jayaram, J. & Das, A. (2015) Strategic purchasing participation, supplier selection, supplier evaluation and purchasing performance. *International Journal of Production Research* 53(20), 6263-6278.

Nielsen, R. (2016) Action Research As an Ethics Praxis Method. *Journal of Business Ethics* 135(3), 419-428.

Nollet, J., Beaulieu, M. & Fabbe-Costes, N. (2017) The impact of performance measurement on purchasing group dynamics: The Canadian experience. *Journal of Purchasing and Supply Management* 23(1), 17-27.

Oh, S., Yang, H. & Kim, S. W. (2014) Managerial capabilities of information technology and firm performance: Role of e-procurement system type. *International Journal of Production Research* 52(15), 4488-4506.

Olsen, R. F. & Ellram, L. M. (1997) A portfolio approach to supplier relationships. *Industrial Marketing Management* 26(2), 101-113.

Onut, S. & Efendigil, T. (2010) A theorical model design for ERP software selection process under the constraints of cost and quality: A fuzzy approach. *Journal of Intelligent and Fuzzy Systems* 21(6), 365-378.

Padhi, S., Wagner, S. & Aggarwal, V. (2012) Positioning of commodities using the Kraljic Portfolio Matrix. *Journal of Purchasing and Supply Management* 18(1), 1-8.

Palmer, R., J. & Gupta, M., R. (2011) Technology-driven convergence of business processes in the acquisition cycle: implications for accountants and educators. *Journal of Emerging technologies in Accounting* 8(1), 65-87.

Panda, P. & Sahu, G. (2012) e-Procurement Implementation: Critical Analysis of the Impact of Success Factors on Project Outcome. *IUP Journal of Supply Chain Management* 9(2), 44-72.

Picoto, W., Bélanger, F. & Palma-Dos-Reis, A. (2014) An organizational perspective on m-business: Usage factors and value determination. *European Journal of Information Systems* 23(5), 571-592.

Piotrowicz, W. & Cuthbertson, R. (2015) Performance measurement and metrics in supply chains: An exploratory study. *International Journal of Productivity and Performance Management* 64(8), 1068-1091.

Piotrowicz, W. & Irani, Z. (2010) Analysing B2B electronic procurement benefits: Information systems perspective. *Journal of Enterprise Information Management* 23(4), 559-579.

Pohl, M. & Förstl, K. (2011) Achieving purchasing competence through purchasing performance measurement system design—A multiple-case study analysis. *Journal of Purchasing and Supply Management* 17(4), 231-245.

Pop Sitar, Corina. (2011) The role of the e-procurement in the purchasing process. *Annals of Faculty of Economics* 1(2), 687-691.

Presutti, W. D. (2003) Supply management and e-procurement: Creating value added in the supply chain. *Industrial Marketing Management* 32(3), 219-226.

Purchase, S. & Dooley, K. (2010) The acceptance and use of eprocurement systems. *International Journal of Logistics: Research and Applications* 13(6), 459-473.

Puschmann, T. & Alt, R. (2005) Successful use of e-procurement in supply chains. *Supply Chain Management: An International Journal* 10(2), 122-133.

Quesada, G., González, M., Mueller, J. & Mueller, R. (2010) Impact of e-procurement on procurement practices and performance. *Benchmarking: An International Journal* 17(4), 516-538.

Rakennusteollisuus (2018) Tilastot ja suhdanteet. [www document]. [Accessed 24 June 2018]. Available http://www.rakennusteollisuus.fi/Tietoa-alasta/Talous-tilastot-ja-suhdanteet/

Ramkumar, M. (2016) A modified ANP and fuzzy inference system based approach for risk assessment of in-house and third party e-procurement systems. *Strategic Outsourcing: An International Journal* 9(2), 159-188.

Ravichandran, T. (2005) Organizational assimilation of complex technologies: An empirical study of component-based software development. *Engineering Management, IEEE Transactions on* 52(2), 249-268.

Rendon, R. (2008) Procurement process maturity: key to performance measurement. *Journal of Public Procurement* 8(2), 200-214.

Ronchi, S., Brun, A., Golini, R. & Fan, X. (2010) What is the value of an IT e-procurement system? *Journal of Purchasing and Supply Management* 16(2), 131-140.

Rotchanakitumnuai, S. (2013) Assessment of e-procurement auction with a balanced scorecard. *International Journal of Physical Distribution & Logistics Management* 43(1), 39-53.

Saad, S., Kunhu, N. & Mohamed, A.M. (2016) A fuzzy-AHP multi-criteria decision-making model for procurement process. *International Journal of Logistics Systems and Management* 23(1), 1-24.

Samaniego, M. J. G., Gutiérrez Arranz, A. M. & San José Cabezudo, R. (2006) Determinants of internet use in the purchasing process. *Journal of Business & Industrial Marketing* 21(3), 164-174.

Sánchez-Rodríguez, C. (2009) Effect of strategic purchasing on supplier development and performance: A structural model. *Journal of Business & Industrial Marketing* 24(3/4), 161-172.

Sánchez-Rodríguez, C., Hemsworth, D. & Martínez-Lorente, Á. (2004) Quality management practices in purchasing and its effect on purchasing's operational performance and internal customer satisfaction. *International Journal of Logistics Research and Applications* 7(4), 325-344.

Saranga, H. & Moser, R. (2010) Performance evaluation of purchasing and supply management using value chain DEA approach. *European Journal of Operational Research* 207(1), 197-205.

Scharl, A., Gebauer, J. & Bauer, C. (2001) Matching Process Requirements with Information Technology to Assess the Efficiency of Web Information Systems. *Information Technology and Management* 2(2), 193-210.

Segev, A. & Gebauer, J. (2001) B2B Procurement and Marketplace Transformation. *Information Technology and Management* 2(3), 241-260.

Sharma, R., Yetton, P. & Zmud, R. (2008) Implementation costs of IS-enabled organizational change. *Information and Organization* 18(2), 73-100.

Sriram, V. & Stump, R. (2004) Information technology investments in purchasing: An empirical investigation of communications, relationship and performance outcomes. *Omega* 32(1), 41-55.

Stricker, N., Echsler Minguillon, F. & Lanza, G. (2017) Selecting key performance indicators for production with a linear programming approach. *International Journal of Production Research* 55(19), 5537-5549.

Tai, Y., Ho, C. & Wu, W. (2010) The performance impact of implementing Web-based e-procurement systems. *International Journal of Production Research* 48(18), 5397-5414.

Toktaş-Palut, P., Baylav, E., Teoman, S. & Altunbey, M. (2014) The impact of barriers and benefits of e-procurement on its adoption decision: An empirical analysis. *International Journal of Production Economics* 158(1), 77-90.

Trkman, P. & McCormack, K. (2010) Estimating the Benefits and Risks of Implementing E-Procurement. *IEEE Transactions on Engineering Management* 57(2), 338-349.

Vaidya, K., Sajeev, A. & Callender, G. (2006) Critical factors that influence e-procurement implementation success in the public sector. *Journal of Public Procurement* 6(1/2), 70-99.

van Weele, A. J. (2002) Purchasing and supply chain management: Analysis, planning and practice. 3. p. London, Thomson Learning.

van Weele, A. J. (2014) Purchasing and supply chain management: Analysis, strategy, planning and practice. 6. p. Hampshire, Cengage Learning.

Webster, F. (1965) Modeling the industrial buying process. *JMR, Journal of Marketing Research* (pre-1986), 2(000004), 370-376.

Weeme, P. T. (2003) Strategies for cutting costs: Turning procurement into a virtuous cycle. *Strategic Finance* 84(8), 38-42.

Wheelwright, S. C. (1978) Reflecting corporate strategy in manufacturing decisions. *Business Horizons* 21(1), 57-66.

Wirtz, B., Lütje, S. & Schierz, P G. (2009) An Empirical Analysis of the Acceptance of E-Procurement in the German Public Sector. *International Journal of Public Administration* 33(1), 26-42.

Wu, F., Zsidisin, G. & Ross, A. (2007) Antecedents and Outcomes of E-Procurement Adoption: An Integrative Model. *Engineering Management, IEEE Transactions on* 54(3), 576-587.

Yu, Y., Yu, H., Itoga, H. & Lin, T. (2008) Decision-making factors for effective industrial e-procurement. *Technology in Society* 30(2), 163-169.

APPENDICES

Appendix 1. Interview questions

1. What is your position in the company and how would you describe your tasks?
2. What are the most important fields in your work?
3. Have you heard about the new system?
4. Which kind of expectations you have towards the new system?
5. How the system could improve the quality or easiness of your work?
6. Which kind of changes you expect to have in your work because of the new system?
7. How can you better use saved time?
8. What are the most significant advantages of the system?
9. How likely you are going to use the new mobile application (in which you are able approve purchases)?
10. What are your most significant concerns related to the system?
11. Which factors will be the most significant bottlenecks when implementing the system?
12. How would you implement the system to your own team? What should be taken into account?
13. What kind of support you/your team would need in implementation (training etc.)?
14. What are currently the most important risks or challenges related to the different stages of purchasing in the case company from your point of view?
15. Does this system help to manage those risks? How?
16. Which kind of effects the system will have on your supplier relationships?
17. Which kind of indicators could be used to measure the performance of the system?