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Improving indirect procurement process by utilizing robotic process automation

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ABSTRACT

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This thesis deals with utilization of robotic process automation in indirect procurement process. Purpose is to investigate, in which tasks robotic process automation can be utilized and what are the benefits and disadvantages of the usage. Thesis is carried out as case study in a company, which is currently planning the adoption of robotic process automation in its business processes.

According to previous studies, robotic process automation can be utilized especially in routine-based, high volume tasks with low irregularity. Especially, external accounting has been seen to be a suitable target for robotics. In fact, the results of this thesis show that invoicing process and vendor data maintenance are areas in which robotic process automation can be utilized. From the indirect procurement point of view, especially vendor creation, invoice processing and vendor data maintenance are tasks that could be performed by the robot.

However, the data quality has been seen to be a barrier for the adoption of robotics. Results show that the usage of robotic process automation is too early from the indirect procurement point of view. Before the adoption, company must harmonize its processes and improve the quality of the base data.

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Tässä työssä tutkitaan ohjelmistorobotiikan hyödyntämismahdollisuuksia epäsuorien hankintojen prosessissa. Tarkoituksena on nostaa esille robotiikan potentiaalisia käyttökohteita sekä siihen liittyviä hyötyjä ja haittoja. Tutkimus on toteutettu tapaututkimuksena yrityksessä, jossa kyseisen teknologian käyttöönottoa suunnitellaan parhaillaan.

Aikaisemmat tutkimukset osoittavat, että ohjelmistorobotiikkaa voidaan ja kannattaa hyödyntää erityisesti rutiininomaisissa, volyymiltaan suurissa tehtävissä, joissa on vähän poikkeuksia. Täten esimerkiksi ulkoinen taloushallinto on osoittautunut potentiaaliseksi käyttökohteeksi. Työn tulokset osoittavat, että erityisesti laskutusprosessi ja toimittajadatan hallinta ovat osa-alueita, joihin ohjelmistorobotiikkaa voidaan soveltaa. Epäsuorien hankintojen näkökulmasta erityisesti uusien toimittajien perustaminen, laskujen prosessointi ja esitarkistus sekä toimittajatietojen ylläpito voisivat soveltua ohjelmistorobotin tehtäväksi.

Robotiikan käyttöönottoa hidastaa kuitenkin laskutusdatan tämänhetkinen heikko laatu. Tuloksista käykin ilmi, että robotiikan käyttöönotto epäsuorien hankintojen näkökulmasta on vielä liian aikaista. Ennen käyttöönottoa, yrityksen tulisi yhtenäistää prosessejaan sekä parantaa järjestelmiin tulevan datan laatua.

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In September 2016, I got my first permanent job and - of course - I wasn't even started to work on my master's thesis then. I knew, that combination of full time job and master's thesis wouldn't be an easy task. However, one year later, I can proudly say that I did it.

For my success, I would like to thank my closest friends and family, who have supported me throughout this tough year. You have kept me focused and encouraged me to go further. You have also balanced my life between work, school and social life. I would also like to thank LUT and my supervisors for the advice and comments. During the last five years, LUT has given me education, new friends and opportunities for the future. I am glad that I chose LUT for my studies.

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Helsinki 01.07.2017

Annika Lintukangas

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1 INTRODUCTION

It has been recently recognized that purchasing and supply chain management play significant role in organization's pursuit to gain competitive advantage (Ellram & Carr 1994; Spekman, Kamauff & Salmond 1994). However, huge amount of resources is usually invested to direct procurement when in the meantime, it is not realized how vital indirect procurement is to firm's overall business (Kim & Shunk 2004; Cousins 1999; Trent & Monczka 1998). It has been argued that effective management of indirect supplies has gained far less attention because - unlike direct items - those are not directly related to firm's profit margins and customer satisfaction (Kapoor & Gupta 1997).

Yet, Cox's, Chicksand's, Ireland's and Davies's (2005) research show that average 38,3 % of firm's procurement is usually categorized as indirect and overall costs are higher than in procurement of direct items. Results include firms from manufacturing-, service- and public businesses. Compared to manufacturing businesses, service businesses seem to have higher indirect spend per cent. In service businesses, average 40 % of firm's procurement was categorized as indirect while in manufacturing businesses the per cent was average 31,1. (Cox et al. 2005) Because of this economic significance of indirect supplies, there is a need for better indirect procurement management and further investigations. Luckily, this field of study have recently gained more attention and researchers have started to investigate the issue. (Trent & Monczka 1998; Cousins 1999; Kim and Shunk 2004)

However, because this group of supplies has been underestimated for a long time, most companies are lacking proper management strategies. In addition, order – delivery processes for indirect supplies are usually poorly defined which results in blind buying. As far as the employees have right to buy anything and anywhere, companies will struggle with expandable supplier databases and lack of proper control. This comprehensively burdens order-delivery process because automation can't be utilized properly and manual time-consuming work steps are required continuously. Especially invoicing processes are struggling with indirect supplies. Every time

when new vendor is used, it must be created manually in the firm's system. This burden companies' databases and complicates the management of vendor information. Also, postings and approval circulations are more complicated because automation tools can't be used in a same way as it is with direct supplies. (Cousins 1999)

In the field of supply chain management (SCM), the role of information technology is huge because it enables the comprehensive management of material flows based on the data provided by the systems. However, previous studies show that the impact on firm's financial performance is sometimes unclear (Hendricks & Singhal 2003; Chopra & Sodhi 2004). According to Hendricks and Singhal (2003), supply chain management systems can even decrease firm's value by an average of 10,28 %. Therefore, the problems regarding existing supply chain management systems should be pointed out more clearly. It is important to focus on existing problems in current systems and find ways to avoid these problems. In addition, reduction of manual work in the processes is crucial to manage material flows effectively.

Because supply chain management systems play such a big role in purchasing, this thesis approaches the problem from the IT (information technology) point of view. Information technology has evolved significantly since 1990s and new ways of doing business has evolved at the same time. With the help of new technology, it is possible to manage huge amount of information and make decisions based on more reliable data. It is also easier to manage the company and increase the value of the firm. (Akkermans, Bogerd, Yucesan & Wassenhove 1999; Davenport 1998; Dehning, Richardson & Zmud 2007) Because basically everything is managed through information technology based systems, it is important to seek new solutions and even more efficient possibilities to manage all that data.

1.1 Research problem and objectives of the study

Objective of the study is to broaden the research field of indirect procurement and support previous findings of the subject. Purpose is to provide better understanding of the current issues in the chain from the technological point of view and address

the suitability of robotic process automation in indirect procurement process. While previous studies have highlighted different e-procurement systems for better indirect procurement management, (Gebauer & Segev 2000; Kim & Shunk 2004, Gunasekaran & Ngai 2008; Davila, Gupta & Palmer 2003) this work seeks to find solutions from robotics and cognitive intelligence -based solutions. Aim is to specify the tasks in which RPA could be used and highlight the benefits and disadvantages that may occur. The results are also intended to serve support and guidance for companies who are considering the adoption of RPA in the future. Research problem consist of one main research question followed by the three sub-questions. These are presented in the figure 1 below.

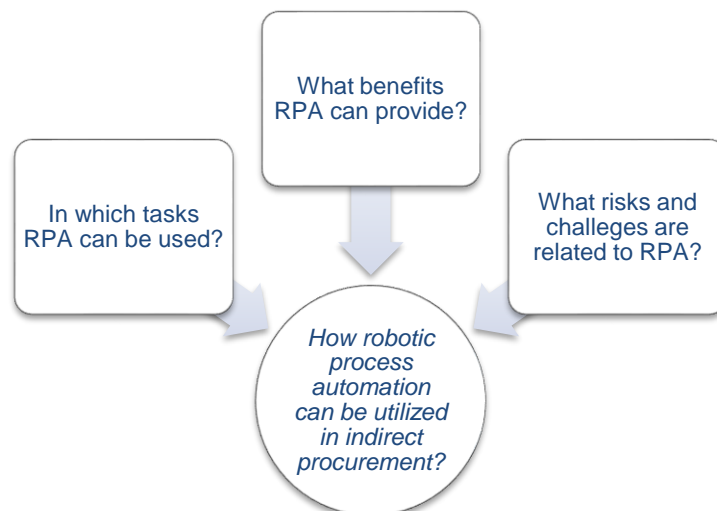


Figure 1. Presentation of research problem

Firstly, purpose is to determine the tasks in which RPA could be used from the indirect procurement point of view. Aim is to get familiar with the whole process and related tasks. By comparing these tasks to RPA success factors found from the literature, new utilization possibilities from the indirect procurement point of view can be found.

Secondly, RPA related benefits are discussed. Investigating the benefits is important because it will explain not only how but also why RPA should be used. RPA as a tool for process improvement is quite new and therefore needs more evidence and visibility of its functionality.

Lastly, risks and challenges related to RPA are investigated. While second sub-question seeks to find explanation for why RPA should be used, this question instead seeks to find answer for why it should not be used or what problems and risks company may face. Always when companies are seeking new tools and solutions for current problems, it is essential to investigate possible risks and benefits of the chosen solution too. Especially when dealing with new solutions without previous experience such as RPA.

1.2 Literature review

In this chapter, findings from the research field of indirect procurement and RPA are discussed. Purpose is to scroll through the previous studies of the subject in order to reflect the results of this work to them. In general, reviewing of articles showed that the research field of indirect procurement and RPA is rather new. Almost all articles are written in 2000 or later. However, there are certain topics that can be recognized.

Literature review reveals that indirect procurement has received far less attention than direct procurement (Gebauer & Segev 2000; Cousins 1999; Kim & Shunk 2004). In some articles separation between these two terms has not been made at all. However, few main trends in the research field of indirect procurement can be found. Some of the findings regarding indirect procurement are presented in table 1.

Table 1: Previous studies on indirect procurement

Authors	Article	Findings
Karjalainen & van Raaij (2011)	An empirical test of contributing factors to different forms of maverick buying	Findings show that limiting the task autonomy of the buyers can reduce all types of maverick buying. Training can prevent the behaviour as well. Investing in reward and sanction systems in turn does not help to reduce maverick buying.
Karjalainen, Kempainen & Raaij (2009)	Non-compliant work behaviour in purchasing: An exploration of reasons behind maverick buying	Researchers have identified five forms of maverick buying and the motivations and reasons behind them.
Kim & Shunk (2004)	Matching indirect procurement process with different B2B e-procurement systems	Findings show that e-commerce is something that can't be instantly placed into existing workplace. Changes, updates, replacements and adaptations are needed throughout the infrastructure.
Gebauer & Segev (2000)	Emerging technologies to support indirect procurement: Two case studies from the petroleum industry.	Findings show that emerging technologies can help to automate processes, enforce corporate purchasing policies and monitor purchasing patterns centrally. This tightens the relationship with suppliers and improves the leverage of corporate buying power.
Cox, Chicksand, Ireland & Davies (2005)	Sourcing indirect spend: A survey of current internal and external strategies for non-revenue-generating goods and services	Findings show that most cited external sourcing management approach for indirect procurement is long-term collaboration with preferred suppliers. Indirect spend is also suffering because of lack of internal support, maverick buying and fragmentation of spend within the organization.
Boer, Holmen & Pop-Sitar (2003)	Purchasing as an organizational design problem: The case of non-product related items and services	Findings show the importance of considering capabilities in explaining why a purchasing department becomes involved or not.
Angeles & Nath (2007)	Business-to-business e-procurement: Success factors and challenges to implementation.	Findings show that three e-procurement success factors and three challenges to implementation can be found. Authors have also stated that most firms start their e-procurement initiatives by purchasing indirect goods.

First trend concerns information technology and different e-procurement systems. This approach will be used in this research as well. As it can be seen from the table 1 above, especially Kim and Shunk (2004) as well as Gebauer and Segev (2000) have been interested in relationship between existing technology and indirect procurement. Kim and Shunk (2004) have discussed about the different e-procurement systems and they have made a matching between these systems and indirect procurement. They have identified areas where different e-procurement systems can be utilized in a hybrid and seamless manner. Researchers have also pointed out that all business requirements can't be met with a single information system and all systems are not equally suitable for different business processes. E-commerce is something that can't be instantly placed into existing workplace. Changes, updates, replacements and adaptations will be needed throughout the infrastructure. Kim & Shunk (2004) have also stated that Internet based e-procurement systems could be the solution for better indirect procurement management. (Kim & Shunk 2004) Probably because of the variety of different systems in different phases of the process, the selection of the most suitable combination is difficult. The need for expertise in the field of information technology will be accurate in the future.

As for the Gebauer and Segev (2000), they have also been interested in objectives and available technologies to support indirect procurement. Likewise, Kim and Shunk (2004), Gebauer and Segev (2000) have addressed the use of Internet based electronic commerce technologies to support indirect procurement. They have tried to identify different critical success factors and key decision points that firm must consider utilizing existing technologies in an optimal way. The study is established through two case studies from petroleum industry. Their findings show that emerging technologies can help to automate processes, enforce corporate purchasing policies and monitor purchasing patterns centrally. This tightens the relationship with suppliers and improves the leverage of corporate buying power. (Gebauer and segev 2000)

Second trend among researchers have been different procurement strategies. Cox et al. (2005) provide evidence from current internal and external sourcing strategies

that are used in indirect spend. Their investigation is based on a survey of 124 respondents. Findings show that long-term collaboration with preferred supplier is most cited external sourcing management approach. Cox et al. (2005) have also stated that indirect spending is suffering because of low internal support, maverick buying and fragmentation of spends within organization. The survey reveals that average 38,3% of total spends is considered as indirect (including manufacturing, service and public sector). Results indicates that indirect procurement is a major concern in companies and new improved strategies are needed. Unfortunately results also show that many organizations do not have fully developed strategies for indirect spend. 15 % of respondents did not have internal strategy at all and 11 % did not have any clear external strategy to deal with indirect spend. (Cox et al. 2005)

Boer et al.'s (2003) findings show the importance of purchase department's involvement in procurement of indirect supplies. They point out that purchases of non-product related items are usually made without involvement of purchasing department. As for more, despite of huge cost saving possibilities in the field of indirect procurement, manages attention is hard to receive. It seems that top management does not prioritize indirect items because these are not related to firms' primary business. (Boer et al. 2003) It is of course understandable since they can't pay attention to every transaction and saving opportunity in the company. However, sometimes there seem to be serious problems in getting purchasing professionals involved because the process is not running through purchasing department. If the process could be re-organized so that the purchasing department is involved, part of the problems could be probably resolved.

Last trend is about maverick buying. Studies show that maverick buying is most commonly linked to indirect procurement such as items related to maintenance, repair and operations. Karjalainen and Raaij (2011) as well as Karjalainen, Kempainen and Raaij (2009) have investigated in different types of maverick buying. Karjalainen et al. (2011) have concentrated on reduction of maverick buying in organizations. Their studies show that limitation of task autonomy of the buyers and training can prevent maverick buying, thus investing in reward and sanction systems

does not help to reduce the problem (Karjalainen & Raaij 2011). Couple years earlier, Karjalainen et al. (2009) focused more on motivations and reasons behind the maverick buying behaviour. Their study shows that for example lack of contract awareness, opportunism and resistance to change are motivating factors behind the maverick buying.

According to Partida (2012), one of the main reasons for maverick buying is saving time. Staff members feel established procurement processes too complicated or just waste of time and bypass standard procedures to procure items. This in turn, increases procurement costs because there are no proper investigations behind the buying decision and the event is more difficult to process. Partida (2012) has stated that the main factor in controlling maverick buying is better understanding of total cost of ownership as well as the whole procurement process.

Table 2 below instead, presents the literature behind the RPA. As it is well known, automation has played increasingly important role in human life for a long time (Singh, Tiwari, Singh 2009). However, while previous studies have mainly focused on using software to automate business processes, recent studies have introduced totally new technologies to service automation, such as Robotic Process Automation and Cognitive Intelligence tools (Lacity, Willcocks & Craig 2015a). Today automation is something that can be inserted into the machine or system to perform (Parsons, 1985), such as RPA. According to Parasuraman and Riley (1997), automation is execution of functions by machine such as computer that was previously performed by the human. This definition is quite exhaustive since robots are designed literally to perform human tasks. However, there are only few studies regarding directly RPA but a lot of studies considering automation in general. Few of the findings from the field of RPA is presented in the table 2.

Table 2: Previous studies on robotic process automation

Authors	Article	Findings
Lacity, Willcocks & Craig (2015a)	Robotic process automation at Telefónica O2	Findings show the success factors for RPA implementation and underline the successful use of RPA in business processes at shared services and outsourcing.
Lacity, Willcocks & Craig (2015b)	Robotic process automation at Xchanging	Findings provide further evidence of the successful use of RPA in business processes. Study also underlines the flexibility of robots.
Lacity, Willcocks & Craig (2015c)	The IT function and robotic process automation	Findings present eight steps for the successful adoption of RPA. Study highlights the adoption of RPA through six case companies.
Slaby (2012)	Robotic automation emerges as a threat to traditional low cost outsourcing	Findings show that RPA could be a threat for the company but on the other hand, there is a possibility to more effective way of doing business. Findings emphasize the possibilities and limitations regarding the use of RPA.

As it can be seen from the table 2, Lacity, Willcocks and Craig (2015a; 2015b; 2015c) have been actively investigating the usability of RPA in business processes. Early adopters of RPA have stated that automation can transform back offices by lowering the process costs in general and improving the service quality. However, in order to achieve actual benefits and maximum results, organization must also learn to manage RPA adoption (Lacity et al. 2015a). This is why Lacity et al. (2015a, 2015b) have prepared two case studies from the field of study.

First case study was implemented at mobile telecommunications provider Telefonica Group. Purpose of the study was to investigate, whether the RPA could integrate with Telefonica's systems of record without breaking them. Purpose was also to investigate the quality and return of investment of the RPA. Results proved that RPA performed the tasks as expected and it worked with company's systems well. According to the study, Telefonica was running around 400 000 - 500 000 transactions through RPA each month and it was estimated that volumes could be increased to around 700 000 transactions. (Lacity et al. 2015a)

Second case study was implemented at Xchanging (Lacity et al. 2015b). Xchanging is a provider of technology-enabled business processing, technology and procurement services. Purpose of the study was to investigate on how RPA was adopted in Xchanging's business. As a result, study showed that RPA fit well with company's core values. RPA was also found to be flexible solution for the company and it was possible to implement it into other tasks in the group as well. (Lacity et al. 2015b) According to the Lacity's et al. research (2015b) Paul Donaldson from the Xchanging has even said that robot can scale up and down and even switch tasks. All that is needed is to train an application once and if tasks change, the robot can be quickly trained to adapt new tasks.

Lacity et al. (2015c) have also examined the IT function and its role in RPA. Purpose of the study was to provide better understanding of RPA functionality for businesses. Problem with the adoption of RPA has been that the companies are unsure on how RPA fits in their IT architectures, skills and security procedures. Clarification is needed because uncertainty has created barriers to adopt RPA. In their research, six cases were examined in detail. Based on empirical examples, 8 steps for the successful adoption of RPA were created.

Slaby (2012) instead, has examined Blue Prism's robotic automation technology and compared it to traditional IT solutions. His study was based on business cases in which robotic automation were adopted. Empirical examination brought up some limitation regarding the use of RPA and highlighted benefits and challenges linked to its use. Slaby (2012) has also gathered some information regarding the internal scepticism and resistance that have occurred in companies. In his research, Slaby's (2012) findings showed that RPA could be disruptive new technology but on the other hand, it could turn out to be profitable.

According to the previous studies, most suitable processes for RPA can be found from the firm's external accounting. (Lacity, Solomon, Yan & Willcocks 2011; Lacity et al. 2015abc; Slaby 2012). Findings show that external accounting include multiple high volume tasks, which are usually well standardized and mature. As for more,

tasks are usually based on predefined rules and processes are simple. (Lacity et al. 2015a) In this thesis, the focus is also in firm's external accounting.

1.3 Theoretical framework and contribution to the subject

Theoretical framework and contribution to the subject is presented in figure 2 below. As it can be seen, topic of the work belongs to under supply chain management. Simply, supply chain management means management of material flows from suppliers to end users (Jones & Riley 1985; Cooper, Lambert & Pagh 1997, Tan 2001). In order to manage these material flows, deep understanding of the procurement process is needed. Deep understanding of the process is also a base for utilizing different technology solutions. Figure 2 also shows the deviation between direct- and indirect supplies. Since most of the previous studies are focusing on direct procurement, this thesis is about indirect procurement.

Theoretical framework consists of two main parts. In the first part, the term indirect procurement is defined in detail and the reader is lead to the target phenomenon. Purchasing process and problems related to indirect procurement are also presented. Purpose is to go through on how purchasing process can be managed in companies and how process is usually organized. Contribution to the subject comes from the second part of the theory. While previous studies have been focusing on different systems to manage indirect supplies, this thesis takes one step further and investigates solutions for process improvement from the RPA perspective. In this part, RPA is defined and current findings regarding successful adoption is discussed. (figure 2)

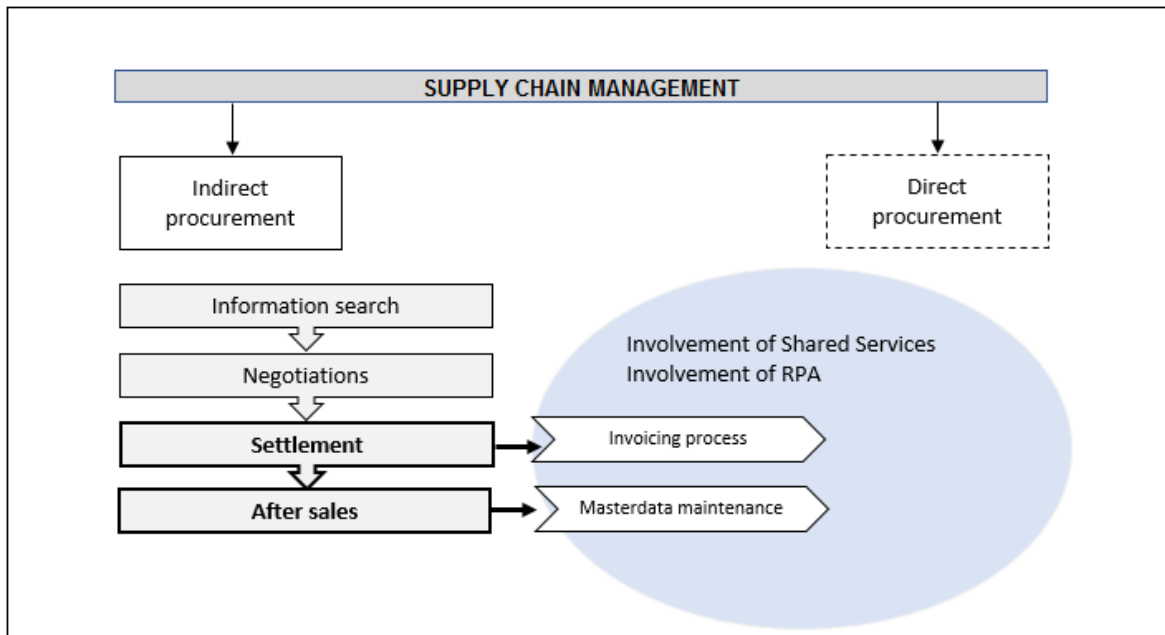


Figure 2: Theoretical framework

According to the previous studies it is known that indirect procurement process is not in an optimal level in efficiency and better understanding of the procurement process is needed. Furthermore, by focusing more on process development, substantial cost savings can be gained (Ellram & Carr 1994; Spekman et al. 1994; Kapoor & Gupta 1997). It is found that for example new electronic systems, education and better involvement of the purchase department in the process could help companies to develop indirect procurement. Yet, it is not known how this process can be developed through automation and robotics. Therefore, this work combines both, indirect procurement and robotic process automation.

1.4 Research methodology

This thesis is carried out with a case study method, which means, that results are limited to a single event (Yin 1994, 5-13) - case company. This method was a best solution for this thesis because RPA is rather new field of study and respondents needed to be familiar with the subject. Furthermore, previous studies have also been carried out with this method. It indicates the suitability of the method to investigate target phenomenon. However, because of the confidential reasons, name of the case company remains unknown.

Data is collected by interviewing three employees from the case company. Also, additional material from the case company is used to support the results. Because there is not enough former knowledge about the phenomenon, collected data was analysed inductively using the qualitative content analysis method. As the chosen research method instructs, gathered data is first pre-processed by summarizing it and cutting it into parts. Secondly, data is organized in different categories to increase understanding of the phenomenon and generate knowledge. Lastly, abstraction process is executed. In abstraction process, each category is named and cut even more specific sub-categories. (Elo & Kyngäs 2008)

Case company was selected to this thesis based on its ongoing project regarding indirect procurement and robotic process automation. In 2017, company begun to investigate possibilities for exploiting robots in business processes. Especially, tasks in general ledger, accounts receivable and payable, cash management and payroll have been in company's interest because these involve a lot of manual work with high volume routine tasks, which don't increase firm's value (Lacity et al. 2015a). At the same time, company has been seeking solutions for better indirect procurement management because lack of buying control increases supplier databases and burdens the whole indirect procurement process. Therefore, new tools especially in invoicing process are needed.

It must be noted that the results can't be empirically generalized because those are limited to concern only one company. Therefore, generalization rises from the theory. In fact, intention of the study is to examine the results on a larger scale to provide evidence and support for further research.

1.5 Delimitations

This work is limited to concern indirect procurement and robotic process automation in Finnish food industry. More in detail, invoicing process and tasks in accounts payable team in shared services department are highlighted. This means, that no further attention is paid to other tasks that the same robot could perform during the

day across the company. However, since the RPA project at the target company concerns the whole shared services department - and no separation between direct and indirect procurement have been made - results are partially extended to concern other external accounting tasks such as bookkeeping.

Secondly, the RPA project at the case company is only at the planning stage. This means that there is no practical evidence of the actual usage of RPA. However, employees have received education and consultation from the RPA provider company and prepared process descriptions and clarifications of the potential tasks that could be adopted by the robot. Therefore, they could provide information regarding the tasks in which they think RPA could be used in the case company and what problems and benefits they may face. Theoretical part is also used to support the results.

Furthermore, only three employees were interviewed for this thesis. Therefore, results are based on their opinions and assumptions. It can't be said, whether the other employees agree with the results. Yet, there are evidence from the previous literature that support findings. Therefore, this case study together with other case studies will complete the research gap regarding RPA and indirect procurement.

1.6 Structure of the work

The structure of the work is twofold and it covers both, theoretical- and empirical parts. First, theoretical part consists of two main definitions: Indirect procurement and robotic process automation. Previous findings regarding indirect procurement, procurement process and problems related to the process are discussed. In addition, RPA as a tool for process improvement is presented. It is discussed, what kind of tool RPA is and what are the factors for successful adoption. Also, previous findings regarding benefits, risks and challenges are highlighted.

Second part instead, consists of empirical research. First, case company is presented and data collection process is described. Analysis method and reliability and validity of the research are also discussed. In the results chapter, interviews are cut

into parts and re-processed in order to draw on results and create answers to the research questions. Results are divided in three different categories according to the defined sub-problems: 1) Task in which RPA could be utilized 2) Incentives to adopt RPA 3) Disincentives to adopt RPA.

At the end of the work, results are discussed and concluded. Findings from the theoretical part are used to support the empirical results through the work. Purpose is to summarize the main findings of the research, compare them to the theory and point out facts that need to be considered when adopting new technologies. Furthermore, suggestions for the future research are discussed.

2 INDIRECT PROCUREMENT

Previous studies have mainly considered procurement process as a whole and no difference between direct and indirect procurement have been made. However, dividing corporate procurement into these two categories, more specific information about the process can be found. This information can be valuable for the company especially if cost savings and competitive advantage is in company's interest (Ellram & Carr 1994; Spekman et al. 1994; Kapoor & Gupta 1997). In this part of the work, a closer look to indirect procurement is taken and procurement process is defined in detail.

Direct procurement includes all goods and materials that are used in the production of manufactured goods. Basically, this can mean raw materials, equipments or services depending on the industry. (Cox et al. 2005) As Cox et al. (2005) have stated in their research, common for direct supplies is also that they are easily recognized, their purchasing is based on contracts and they are easy to manage. This means that the purchasing processes are designed to work in an optimal way. In practice, this can mean high level of automation, standardized invoicing processes, discounts and close -long-term- relationships with key vendors. Because direct supplies are linked to company's core business, the supplier selection should be made with caution in order to improve the quality of end product or service.

However, indirect procurement consists of other supplies that company uses in day-to-day operations but not in manufacturing of goods. (Kim and Shunk 2004; Telgen & Boer 1995) These are items that company needs in day-to-day operations but which are not generating any revenue. Also, every product or service that is bought freely without contracts or without purchasing department's involvement are considered as indirect supplies (Cox et al. 2005; Kim & Shunk 2004). Because the concept of indirect procurement is quite large, different terms are used to describe it. For example Cox et al. (2005) and Telgen and Boer (1995) have discussed about indirect spend and non-revenue-generating-goods instead of indirect procurement. As for Karjalainen and Raaij (2011), they have used the term "maverick buying" to describe non-compliant and off-contract buying of goods and services.

According to De Boer et al. and van Weele (2003; 2005) at least five characteristics for indirect procurement can be found. First, indirect items include a large scale of different products and services, which are usually bought from large scale of different vendors. Secondly, purchasing can be time consuming since items are delivered only in small batches. Thirdly, purchasing decision is usually made in a last minute, which means that no proper planning is usually made. Fourthly, the consumption speed of indirect items is usually irregular, which makes the estimation of the need difficult. Lastly, acquisitions are usually made in different parts of organization and proper management of these acquisitions is missing. Boer et al. (2003) have also stated that one of the main characteristics is that the management is not interested enough of this issue. This is why purchasing department has to create an actual business case for indirect supplies. Proper financial evidence has to be gathered in order to catch top management's attention. In a long run, it is noticed that management's support and purchasing professionals' involvement in the indirect procurement will create strategically more sustainable base in organization's procurement and lead to better profitability (Haake & Seuring 2009).

A range of indirect supplies can be very board, which is why they should be categorized. In the table 3 below, typical items and services are categorized. (Iloranta & Pajunen-Muhonen 2008, 366) As it can be seen from the table 3, typical categories are related to real estate and infrastructure, human resources, IT and knowledge transfer and office equipment. Also, other items can be found, such as marketing research, transportation and financial and legal services. Of course, it is important to remember that categorization depends on the company and situation in which the items are used. Because of the large variety of indirect supplies, the categorization is not an easy task. In some cases, it can be even impossible.

Table 3: Categorization of indirect supplies (Iloranta & Pajunen-Muhonen 2008, 366; Cox et al. 2005)

Group	Examples
Real estate and infrastructure	<ul style="list-style-type: none"> • Buildings • Technical systems and services • Maintenance and repair • Electricity • Cleaning and sanitation • Furniture
Human resources	<ul style="list-style-type: none"> • Working clothes • Health care • Travel services • Recruitment services • Accommodation • Training • Consulting
IT & knowledge transfer	<ul style="list-style-type: none"> • Machinery and equipments • Licences • Printers • ERP and IT systems • Support services • Information services • Mobile phones
Office equipments	<ul style="list-style-type: none"> • Papers • Packaging material • Marketing kits and materials • Books and magazines
Other	<ul style="list-style-type: none"> • Transportation • Marketing research • Financial services • Legal services

2.1 Four-stage model for procurement process

A lot of definitions and studies regarding procurement process can be found from the literature. However, huge amount of these studies describe the procurement process in general. Only some of the previous studies focus on detailed tasks in the process and define the role of information systems in it. Kim and Shunk (2004) are one of the researchers who have defined procurement process in detail and

matched the existing information technologies in the process. Their study, in fact, concerns indirect procurement as well. This knowledge is crucial for this work since the purpose is to evaluate a tool, which uses these systems.

However, probably one of the most commonly known ways to define purchasing process is a so-called four-stage model (Kim & Shunk 2004). This four-stage model consists of following steps: Information research, negotiation, settlement and after sales (Presutti 2003; Gebauer and Scharl 1999; Kraut, Steinfield, Chan, Butler & Hoang 1998; Boer et al. 2003) (figure 3). These steps are presented below in figure 3.

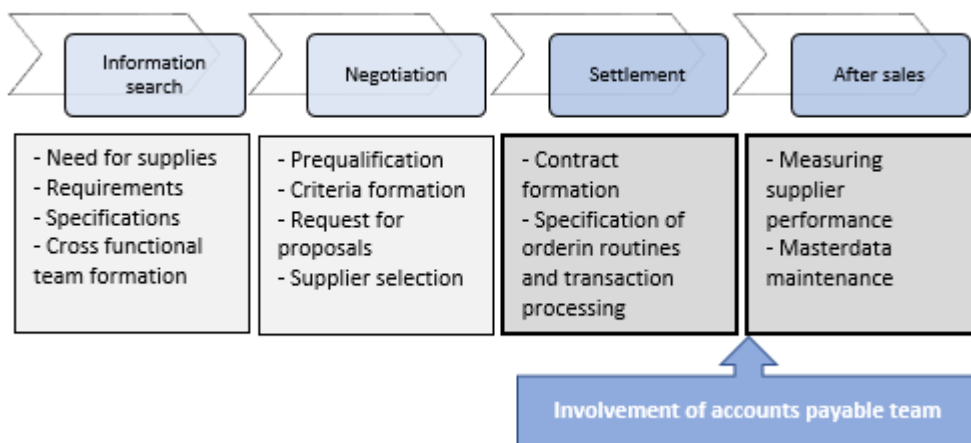


Figure 3: Indirect procurement process (Adabted from Presutti 2003; Gebauer & Scharl 1999; Kraut et al. 1998; Cousins, Lamming, Lawson & Squire 2008, 60-61)

In order to manage the whole supply chain, activities in each phase of the process need to be coordinated. Kim and Shunk (2004) have stated that there are two ways to coordinate transactions between a selling and buying organization: bilateral and multilateral. First one means bilateral contact between buyer and seller and second one means multilateral contact using intermediaries like e-marketplaces. Typically, these transactions involve huge amount of information processing and communication, which is why information technology support and automation is needed

throughout the process. For example, Internet and web-based systems provide support for all steps throughout the transaction. (Grieger 2003)

2.2 Information research

Before the supplier can be selected, the company has to gather information about the possible suppliers. Based on gathered information, purchasing professionals (usually with cross-functional team) compare different alternatives and create well-specified contracts. Gathered information could concern for example background information of the possible suppliers or detailed information about the product or service. (Iloranta & Pajunen-Muhonen 2008, 251, 263-264) If company has e-procurement system for indirect supplies, these pre-defined contracts are linked to that system as pre-contracted catalogues.

In the case of indirect procurement, purchasing process always starts with the need for supplies. (Presutti 2003) Essentially, this means that the purchaser (usually an end user employee) uses these previously mentioned pre-contracted catalogues. These catalogues are preferred for the strategic procurement because those restrict buyers in so that they can't buy anything and anywhere. In this case buyers are "forced" to use suppliers behind the contracts. If required items can be found from the catalogue, purchaser passes the items into shopping cart of the internal (buy-side) or external (sell-side) e-procurement system. (Kim & Shunk 2004,) However, if required items can't be found from the pre-contracted catalogues, purchaser need to rely on external off-contracted sources. This is also the case if the company doesn't have any system in use.

Shopping cart usually contains a list of selected items, company specific pricing per item and total cost of order. If purchasing is made with buy-side e-procurement system. Purchaser will also receive specification with standard profile information such as name, shipping instructions, account authorization and payment mechanism. If the purchasing is made using the sell-side e-procurement system, it will be processed in so that suppliers merchant server, catalogue server, back-end accounting system and inventory system is involved. (Kim & Shunk 2004)

After the item is selected and shopping cart is checked, the requisition is created and approved. Usually needed approvals are processed through buy-side e-procurement systems or back-office purchasing system such as ERP (Enterprise Resource Planning System), e-mail or intranet. Some items might not require approval because those are pre-approved. Usually non-standard items and requisitions that are from off-contracted sources are routed directly for approval. (Kim & Shunk 2004) This is one way to manage purchased items inside the company. If approval is not needed, requisition is turned directly into a purchase order.

2.3 Negotiation

At the negotiation phase, prequalification of the suppliers is made and requests for proposals are presented (Kraut et al. 1998). In this phase, the supplier that meets the buyer's needs in an optimal way is selected (van Weele 1994). However, before the selection, price negotiations might be needed.

Negotiation phase does not always take place in the purchasing process. For example, in the case of standard requisitions such as pre-approved requisitions for pre-contracted items, purchasing is directly turned into purchasing order in the e-procurement system or in the back-office purchasing system such as ERP. (Kim & Shunk 2004) However, in the case of approved off-contracted non-standard items, negotiation mechanisms might be needed.

Kim and Shunk (2004) have stated that at least five negotiation mechanisms for the best price can be found. First mechanism is about online shopping at the sell-side e-procurement system or at third-party e-marketplace. Online shopping can be made through catalogue-based shopping where for example price comparisons, auctions and group buying can be considered as negotiation tools. (Kim & Shunk 2004) In group buying the firm has the possibility to use its purchasing power and demand aggregation. This means that prices can be negotiated according to purchase volume. Also, payment terms are easier to negotiate when the volume is high.

Second negotiation mechanism is about negotiation with pre-established partners. With these pre-established partners, negotiations can be made for example through bilateral direct negotiation on price. Usually electronic documents and message exchange systems are used to support these negotiations. (Kim & Shunk 2004) Third negotiation mechanism is exchange service at the third-party e-marketplaces. Exchange service can mean for example mutual-, two-way- or double auction. (Kim & Shunk 2004) It can also be so called "bid-and-ask" -situation. This means that best price will be in the point where item is sold and bought at the best price at a given point of time. The bid price represents the maximum price that a buyer is willing to pay for an item. Ask price instead, is the minimum price that a seller is willing to receive. (Copeland & Galai 1983; Glosten & Milgrom 1985)

There are also other pricing mechanisms that the purchaser can use. One of them is reverse auction and bidding at the third-party e-marketplace or buy-side e-procurement systems. (Kim & Shunk 2004). Reverse auction means dynamic auction that is established in real time via Internet. In the auction a group of pre-qualified suppliers compete to win a contract to supply goods or services that have defined specifications for design, quantity, quality, delivery and related terms and conditions. (Beall, Carter, Carter, Germer, Hendrick, Jap, Kaufmann, Maciejewski, Monczka, Peterson 2003) Last pricing mechanism according to Kim & Shunk (2004) is based on offer-to-buy posting services such as bulletin board, trade directory and post-and-browse. These pricing mechanisms are usually utilized at third-party e-marketplaces or content and community portals.

2.4 Settlement

According to Kim and Shunk (2004) settlement phase can be divided in three phases. In the first phase the purchase order is generated and placed. This means that buy-side e-procurement system will check if items can be found from the catalogue or not. If requested item requires multiple suppliers, the requisition is split into several purchase orders. Buy-side e-procurement system can automatically verify and approve the purchase order if the requisition is standard or pre-contracted. If the requested item is not available for certain supplier, the system will check if there

are other pre-approved suppliers available. After the purchase order is verified and approved, the system will place the order with the supplier for fulfilment. If supplier uses sell-side e-procurement systems, the purchaser can place the order directly at the supplier's websites. (Kim & Shunk 2004; Goodchild, Herring & Milosevic 2000)

Second phase of settlement phase consists of order tracking and receiving the item. Nowadays, purchaser can track the order status and receive information if there are any delays in the delivery. (Hammer 1990; Goodchild et al. 2000) This information is valuable for the company because it allows companies for example to predict the exact time for the delivery. Third phase instead, consists of invoicing and payment. Today, great integration between the different systems in the company, allows invoices to be automatically matched against purchase orders (Goodchild et al. 2000). However, matching is not always as easy as it seems. Prices and quantities identified in the contract may differ from the actual amounts received and paid. In this case, manual work might be needed in order to get invoices booked and transferred to the accounting. Once items are booked, reviewed and approved successfully, the invoice is paid on due date.

Furthermore, not every company have proper systems for indirect supplies and therefore some of the statements above can't be adapted to every company. If there are no system behind the indirect items, it means that orders are made via cell phone, e-mail or other equipment that purchaser owns. This also means that the purchase is in employees email (or in other equipment) until the invoice is sent to company's invoice processing system. However, as far as there are no system for indirect supplies, it might be difficult to control the purchases in the company.

2.5 After sales

After an actual decision and contracting, starts after sales -phase (Gebauer & Scharl 1999). The purpose of this phase is to evaluate the performance of a supplier and follow that the supplier meets the objectives that are specified in the contract. (Cousins et al. 2008, 60-61; Goodchild et al. 2000) According to Presutti (2003) this is also

the stage when supplier evaluation systems are involved. The purpose of the system is to store the data in order to assess supplier performance and provide information for further investigation and supplier rating.

2.6 Costs of indirect procurement

But why it is important to pay attention on indirect procurement since they are not generating any revenue for the company? The answer is of course in the cost side. As Telgen and Boer (1995) have stated in their research, a lot of money is involved in indirect purchasing. As for more, in the most cases this money is not spent in an optimal way as it is with direct purchasing. By focusing more on this group of supplies, it would be possible to gain substantial cost savings and competitive advantage (Ellram & Carr 1994; Spekman et al. 1994; Kapoor & Gupta 1997).

From the economical point of view, there are many things that need to be improved in the purchasing process of indirect supplies. One of these development targets is concerning Maverick buying. Maverick Buying means non-compliant, off-contract buying of goods and services (Karjalainen & Raaij, 2011). Maverick buying exists in every company and it is usually linked to procurement of indirect materials. According to Partida (2012) Maverick buying occurs usually because employees feel that the existing procurement process is too complicated or a waste of time. Karjalainen and Raaij (2011) have defined three forms of maverick buying:

1. Maverick buying to get better terms and conditions
2. Maverick buying to maintain a previous supplier relationship
3. Maverick buying due to unawareness of frame agreements in existence

In the first form, employees compare existing contracts made by the firm to other external alternatives. If the price of an alternative supplier is lower than the price negotiated by the company, employee might think that buying external alternative lowers the costs of a company and saves time. However, this action seldom lowers the costs of a company. Lack of knowledge will restrict employee to think the whole process. Second form occurs when employee prefers more familiar sources than

sources defined by the company. It might be easier for employee to use sources that they have used before because then they know how to order and what they will get. In this form buying behaviour is based on customary habits and previous relationships. Third form of maverick buying concerns unawareness of frame agreements set by the company. Karjalainen and Raaij (2011) have claimed that this is the most common form of maverick buying.

Buying independently increases purchasing costs significantly and decreases the efficiency of procurement process itself (Karjalainen & Raaij 2011; Angeles & Nath 2007). It would not be that important if it is done once or twice, but unfortunately this problem accumulates significantly especially in big companies. Angeles and Nath (2007) have stated that buying independently rise procurement costs by 20 % compared to purchases that are negotiated by purchasing professionals of the company. Extra costs occur because non-standard items are purchased in small orders (Telgen & Boer 1995).

It will also take more time to find the vendor and get the invoice through firm's invoicing process. Invoicing is a huge part of a procurement process due to the huge number of invoices that need to be processed before the due dates. Buying only a single item doesn't affect firm's performance yet but when purchasing is considered as a whole, hundreds or even thousands of invoices go through the company's invoice processing system every day. This causes a lot of manual work for the company, even though parts of the process can be easily automatized. (Keifer, 2011) For example, in accounts payable department it will take time to create a new vendor in the database and make the postings correctly since it is difficult to find correct accounts, cost centres and approvers for the invoice.

Maverick buying also effects on company's ability to gather data on spend patterns (Angeles & Nath 2007). When there is not enough information about the purchased product or the vendor, it is impossible to make any analyses or comparisons with other products that are purchased according to firm's guidelines. The lack of information also diminishes the procurement visibility over its expenditures (Angeles &

Nath, 104). Telgen and Boer (1995) have agreed that wide ranges of items are purchased from even bigger range of suppliers, which means that indirect buying increases firm's supplier bases without any good reason. Supplier base rationalism has been the hot topic for companies in recent years. Companies have started to reduce their supplier bases to gain cost savings and reduce costs. (Cousins 1999) However, maverick buying increases the supplier bases significantly all the time especially if buyers have ability to buy anything and anywhere.

3 AUTOMATION TO SUPPORT INDIRECT PROCUREMENT

The development of information systems has been incredibly fast over 30 years. First systems were invented in 1960s when the electronic data processing became more common. However, the breakthrough was in 1970s, when the first management systems enabled better data processing and better coordination between the business units. (Grover, Teng & Fiedler 1998) Since then, technology has continued developing and enabled new and more efficient options for companies. Today information systems are operating tools for management and other parties but they also have strategic meaning. Especially Internet -based information systems as well as large enterprise resource planning systems have become more popular. (Grover et al 1998; Irani, Ezingard & Grieve 1997)

Behind the well-coordinated and integrated supply chain there are always some kinds of information systems. As Kim and Shunk (2004) have stated, usually companies need to adopt different systems in order to manage supply chain properly. In big companies, enterprise resource planning system (ERP) is usually considered to be a heart of all surrounding smaller systems and applications. ERP system is the one that integrates the whole system pallet in the company. Tseng, Chiang and Lan (2009) defined integrated supply chain as a coordination of material flows, information and implementation of products. A high level of integration is expected to result in competitive advantage (Tseng et al. 2009; Anderson & Katz 1998; White, Pearson & Wilson 1999).

However, information systems have long been utilized in the routine buying procedure context. This is due to the fact that direct procurement can be easily scheduled to meet the demand, sufficient information about the demand is available and sources of procured items are reliable and secure. For example, in big companies electronic data interchange application has provided the basis for just in time deliveries and automation. Indirect procurement instead, has historically received far less attention in organizational level and among information technology. In recent years, companies have become more aware of the different Internet based applications and the possibilities that these applications may provide. (Kim & Shunk 2004; Davila

et al. 2003) Most commonly known way to manage indirect procurement today, is via e-procurement systems (Kim & Shunk 2004).

3.1 E-procurement

E-procurement can be defined as an organization's procurement using the Internet based technologies (Davila et al. 2003). E-procurement systems instead, can be defined as various Internet based B2B (Business to business) systems located in the buyer, supplier or in the third party. These have been seen suitable options for indirect procurement because systems support and automate indirect procurement in many ways. (Kim & Shunk 2004) These systems are also the key for strategic procurement because via these systems it is possible to restrict employees to buy anything and anywhere. System guides the buyer to use re-defined product catalogues, which are based on contracts. E-procurement systems have also enabled the adoption of other IT solutions.

In order to better understand the functionality of different systems, few words might need clarification. First of all, electronic catalogues mean lists from which the buyer is able to search the items and find specific product -related information. In order to use these catalogues, user of the e-procurement system has to request suppliers to distribute their catalogues to the market. User also has to create all the details and specifications into the catalogue based on buyer's requirements. Copy of this aggregated catalogue is usually transferred to buyers' intranet. (Dai & Kauffman 2001)

E-procurement solutions instead, can be roughly divided in three parts: Buyer- and supplier centric solutions and third party e-marketplaces. (Grieger 2003; Dai & Kauffman 2001) Essentially, this means that buyers can use the system through firm's own workspace or the buyer can log in to external sources, which are managed by external supplier or third party. However, in each solution the buyer is restricted to use previously mentioned catalogues and therefore buying is more strategic. Discussed e-procurement solutions are described in figure 4.

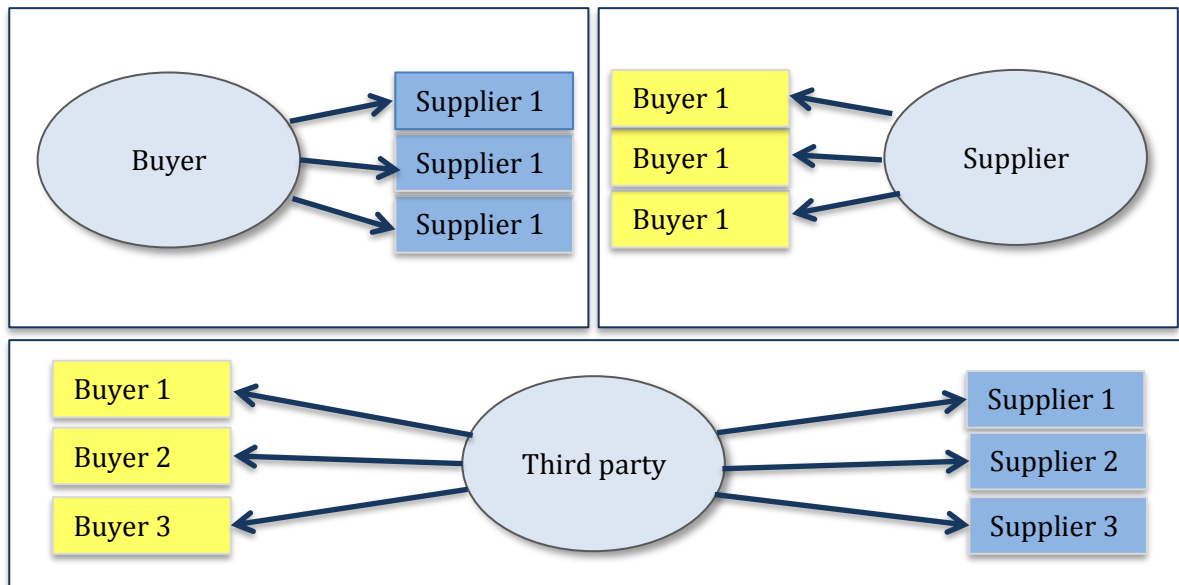


Figure 4. E-procurement solutions for management of indirect supplies

Buyer centric solution (e.g. bulletin board & desktop purchasing systems) means that the vendor catalogue is in buyer specific format and the buyer firm is responsible for the copy of a catalogue. (Kim & Shunk 2004; Archer & Gebauer 2000). This solution strengthens the support of internal authorization and licencing procedures and reduces process turnaround times. If the firm decides to use buyer centric solution, procurement processes are also easier to organize in a company specific manner. Usually the objective of this solution is to reduce procurement costs by combining the forces with other large buyers. (Grieger 2003) Because of the cost and time savings, purchasing and accounts payable personnel have more time to focus on strategic tasks instead of routine work (Archer & Gebauer 2000). Some studies have pointed out that by using buy-side solutions, it is also possible to eliminate maverick buying. (Issa, Flood & Caglasin 2003; Archer & Gebauer 2000) This is due to the improved information quality and restrictions in the way of doing purchases. With this system, purchased items are partially forced to go through the system and buyer doesn't have the opportunity to buy anything and anywhere. Reduction of Maverick buying instead, lead to more favourable contracts with fewer suppliers.

However, there are also some disadvantages regarding buy side e-procurement solutions. For example, purchasing of complex products is more difficult because the supplier does not usually support those. The quality of the product data can be also poor. It is also a fact that not every supplier has a possibility to offer electronic product catalogue. It might be possible that there are cheaper and better suppliers in the markets but buyer centric e-procurement solution prevents to use them.

Sell-side solution instead, means that software services are located at the seller (Archer & Gebauer 2000). Archer and Gebauer (2000) have stated that the sell-side solution might become a strategic necessity if the network of buyers becomes large enough. Usually, multiple sellers are brought together into a central catalogue and product information repository. The key is to provide a forum for multiple sellers in which they can present their catalogues and meet as many buyers as possible. (Grieger 2003) In this case, also complex products are possible to handle. It is also easier to manage product lists and prices because there are no operating costs involved. This is because the lists are located at the seller. In this model, order is directly put into the supplier's system and this shortens product delivery time. However, because the system is located at the supplier, it restricts the automatic documentation and product comparisons. In this solution, integration of different systems might be also more difficult. (Archer & Gebauer 2000)

Last e-procurement solution is third-party e-solutions that provide support for both buying and selling processes (Archer & Gebauer 2000; Grieger 2003). An intermediary operates this solution. Because third-party marketplaces are equally attractive for both parties, there might be a problem with participating in the market. Buyers don't want to participate if there are not enough sellers and Sellers don't want to participate if there are not enough buyers (Grieger 2003). Integration into the ERP systems of the procuring company is also more difficult. However, this solution reduces the search time of the procured items and procurement is possible to do anonymously. Transactions are also usually more efficient and different offers are easier to compare.

3.2 E-procurement to enable process automation

Kim & Shunk (2004) as well as Davila et al. (2003) have stated that use of e-procurement systems has yielded to significant benefits. It is said that by using e-procurement systems in an optimal way, company has possibility to reduce administrative costs, shorter cycle time of order fulfilments and lower inventory levels. E-procurement systems have also yielded to price reductions. (Gunasekaran, McGaughey, Ngai & Rai 2009) According to Davila's et al (2003) research companies that use e-procurement technologies have gained approximately 42 % savings in purchasing transaction costs. However, the most significant benefit from this work's point of view is that the e-procurement has enabled the better automation of indirect supplies (Gunasekaran et al. 2009). As far as the information is in electronic format, different automation tools can be used. However, e-procurement itself is not automation yet.

Process automation can be implemented in many ways and some automation options are more favourable than others. There are also various definitions for automation. For example, automation can be built in or configured in existing systems or it can be an external solution such as RPA. In this research, automation means that computer performs the tasks that were previously performed by the humans. By using this kind of solutions, mechanical time-taking tasks can be reduced (Parasuraman & Riley 1997). However, full automation of cognitive activities remains rare. Good examples of automation are automated flight management systems and cruise controls in cars.

Previous researches show, that automation can replace human work partially or fully. This means that there are different levels of automation in companies. As Parasuraman and Riley (1997) have stated, cognitive activities are usually only partially taken into use. This is due to the fact that cognitive automation is still under the development and research. However, several levels between these two extremes (fully and partially) can be found. (Parasuraman, Sheridan & Wickens 2000) Different levels of automation are presented in figure 5 below.

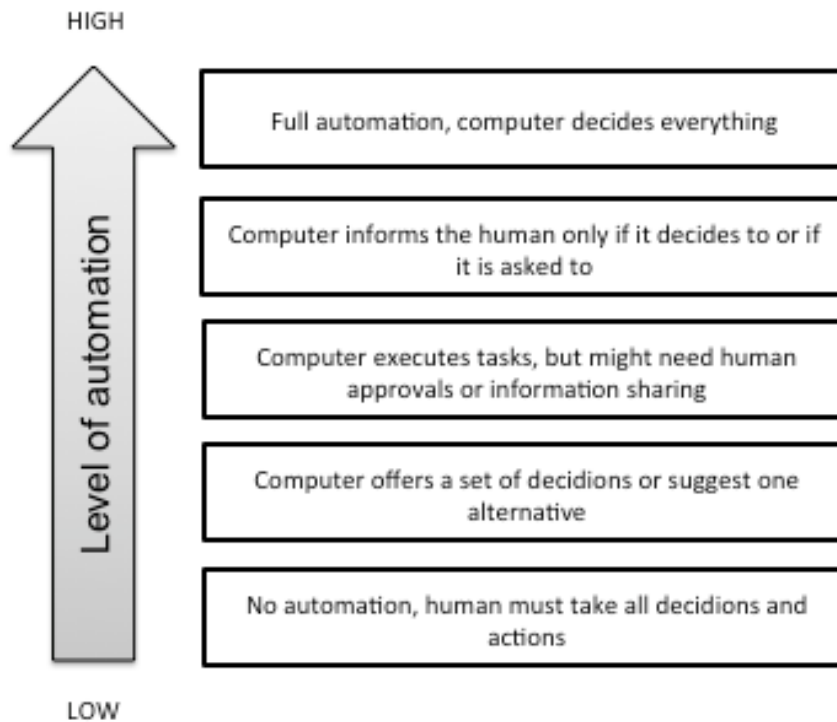


Figure 5. Levels of automation in decision and action selection (Adapted from Parasuraman, et al. 2000; Sheridan & Verplanck, 1978)

As it can be seen from the figure 5 above, at lowest level of automation, computer does not make any decisions or actions. In this case employees have to perform all the tasks by themselves. (Parasumaran et al. 2000) Today, this is quite rare because many tasks are performed using the information technology. Computers as well as different systems and software might include built-in automation modules that the end user doesn't even know about. There are also a lot of tasks that are automated but the user doesn't even realize it. (Lee & See 2004)

However, when the level of automation increases, humans are less and less involved to the performed task. For example, in the mid-phase, the computer gathers the group of solutions and alternatives but before the task is performed, human approvals might be needed. It is also possible to set the system to inform humans before any actions are taken. (Parasumaran et al. 2000) This is probably the most commonly known way to automate business processes. As mentioned, automation is always present at some level if computers are involved but on the other hand, full

automation is rare due to the human expectations and trust in automation. People are seen to respond automation socially. Trust and other social factors influence reliance on automation. (Lee & See 2004)

High level of automation instead, means that computer performs the tasks without human involvement. (Parasumaran et al. 2000; Endsley 1999) These are usually tasks that don't need any creative thinking, decision-making or planning. However, as Lee and See (2004) have stated in their research, this level of automation is rare because social factors such as human trust restricts its full implementation. Perhaps in the future, full automation of processes will take place.

3.3 Robotic Process Automation (RPA)

As it is stated in previous chapter, e-procurement has enabled the automation of tasks in many ways. However, there are several features that distinguish the robotic automation development approach from the traditional approach to automate tasks and processes in a company. Training of robots for example, will take only few months of modellers and analysts' time, while traditional software development requires experienced software architects and engineers. It also possible to transfer the knowledge - that has been thought to one robot - to new robots. In traditional IT-solutions, components can be re-used as well but it is considered to more expensive. (Slaby 2012) Furthermore, robots can perform more complicated tasks compared to traditional solutions and could be therefore used more widely.

Although Robotic Process Automation sounds like physical robots that are walking around the office performing different human tasks the term really means automation of human tasks that were previously performed by humans (Lacity et al. 2015a). These digital employees try to mimic humans' way to use computer. These digital co-workers are part of a team and when needed, different tasks can be thought to them. Robots itself are not in physical format like they are in factories, but they operate inside the computer with their own user identification number and password. Usually robots have even their own names. In addition, compared to human work force, digital work force can be used 24 hour per day. That is what makes them

efficient. In business processes, RPA as term usually means changing software pallet in so that the work can be transferred from the human workforce to digital workforce (Lacity et al. 2015a). This could mean for example transferring the data from multiple sources (e.g. from email, spread sheets, folders) to new location, such as to firm's enterprise resource planning system or supply chain management systems.

Robots can be divided in three groups. First group consists of virtual assistants. Virtual assistant is a personal productivity tool that is installed into the workstation and processes are automated centrally inside the workstation. Typical way to teach virtual assistants is recording. It is possible to record the whole process or only a part of a process. Virtual assistants are best suited for improvement of labour productivity and automation of knowledge work. Unlike other robot types, the individual users control virtual assistants personally. (Cooper, McElroy, Rolandi, Sanders, Ulmer & Peebles 2004)

Second robot type is so-called robotic process automation. RPA is software-based solution, which means that one robot equals one software licence. This robot solution can be utilized companywide. (Lacity et al. 2015c) By using this solution, it is possible to automate multiple processes between different units at the same time. According to Lacity et al. (2015c), this solution is most commonly used in so called "swivel chair" processes. Swivel chair process consists of three steps. First, human gathers inputs from multiple sources such as from excel and csv-files, email, word, discussion boards, Skype etc. In second phase, human processes this information. This phase is usually based on rules. In the last phase, human enters the outputs into system of record (e.g. ERP).

Common character for RPA robots is that they are not intelligent. Robots are only able to do things that have been taught to them. Essentially, this means that every new transaction will require more teaching. If the robot is taught wrong, there is a risk that the robots are performing tasks systematically wrong (Wiener 1988). This is why robots need to be followed and managed as well.

Third robot type is based on cognitive learning and artificial intelligence. These robots learn by doing. Typically, cognitive robots analyse fast huge amount of information received from the different databases. These robots can also learn from different interactions and they will collect data from the surrounding environment. The system utilizes big data and combines different data sources. (Chien, Roger, Veda, 2012; High, 2012) For example, IBM Watson (High, 2012) and IPSoft's Amelie (Lacity, 2017) are considered to be cognitive systems that use artificial intelligence. However, according to Lacity et al. (2015c), these more advanced forms of robotics are still in the drawing board or only being piloted for future commercial development.

3.4 Adoption of RPA

Successful adoption of RPA will require deep analysis of the target process. Process should be cut in to parts and different tasks inside the process should be determined (Lacity et al. 2015a; Slaby 2012). As Lacity et al. (2015a) have stated, adopters of RPA often ask how to assess the suitability of RPA to their existing processes. Based on their findings, this chapter aims to point out attributes that enable successful adoption of RPA.

First, high-volume processes are considered to be suitable for robots because the high volume also indicates opportunity to reduce costs (Lacity & Willcocks 2012). High volume can mean the amount of repetition or only the time used to complete certain task. Usually repetition means that the task is quite simple and could be performed by non-professionals. Because human workforce is expensive, these are tasks that should be outsourced to robots. Robots can complete the tasks faster and with fewer errors. While robots are performing these mechanical high volume tasks, humans can concentrate more on tasks that increase firm's value. (Singh et al. 2009)

Second suitable attribute for RPA is the level of process standardization (Lacity et al. 2015a; Mclvor, McCracken & McHugh 2011). According to Mclvor et al. (2011) highly standardized processes that will produce similar outcomes would be valuable for robots. For example, if customers expect the same service, robots can guarantee

that the service is similar every time. Robots could for example send same reports every month at the same time for same customers. This could even increase the customer satisfaction. The more standardized the process is, the fewer exceptions usually occurs. Exceptions are critical for robots because they are not intelligent. If there are exceptions in the process, robots don't know what to do with them. In this case, robots need to skip these tasks and left them to the humans. (Wiener 1988) This is also linked to data quality. The source data has to be correct in order to teach the robots. If the source data is wrong, naturally the robot doesn't know that. In this case, the robot might process the task anyway and make mistakes.

Thirdly, the more the process is based on different rules, the more suitable it would be for robots (Lacity et al. 2015a). Rule-based tasks are easier to process because everything can be documented. This instead, will lead to lower knowledge transfer costs and reduction of tacit information (Srikanth & Puranam 2011). Rules are also something that could be easily taught to robots and if some of the rules change, it can be easily changed in a robot as well.

Process maturity is also considered to be one of the success factors for adoption of RPA (Bidwell 2012; Lacity et al. 2015a). Lacity et al. (2015a) have stated that mature processes are easier to transfer for robots because usually those are measured, well documented, stable and predictable. Costs structure of the process is also better known when the process is mature because there has been more time to investigate it. Detailed information will also prevent mistakes in adoption of robots because the required tasks are known better. In the implementation phase, it can be hard to remember all the activities that employees have done when processing the tasks. If processes are well known, testing of the robot and teaching will take less time.

Good candidates for RPA are processes that need access to multiple systems. This is attractive for robots because going back and forth between different systems doesn't require any special skills. This is also something that can be easily taught for robots and it doesn't require any configurations between the existing systems. As a contrast, configuration of traditional systems would be more expensive and

time-consuming even though used components and modules can be reused. There is also bigger probability for mistakes in the re-configuration. (Slaby 2012)

Last success factor for adoption of RPA is level of human intervention and process complexity. Human intervention means that the task requires analytical and professional skills. This is something that can't be fully taught to robots. (Parasuraman & Riley 1997) The purpose of the RPA is to release humans from the tasks that don't require any special skills and give them opportunity to focus on analytical and more complex tasks.

3.5 Benefits of RPA

Like industrial robots, RPA can yield to multiple benefits. Probably one of the biggest benefits is saving time (Lacity et al. 2015a). Since robots are designed to work faster than humans and with fewer errors (Heyer 2010), expensive human resources can be released into better use. Employees have possibility to focus on tasks with higher value. This in turn, affects job satisfaction and creates value for the firm. Basically, all rule-based tasks that don't require deep analysis or problem solving can be taught to robots. Furthermore, they can work 24 hour per day without any breaks, holidays and sick leaves (Slaby 2012).

Secondly, RPA improves monitoring of processes because every action of a robot can be recorded. (Slaby 2012) This means, that employees can return to performed tasks and find the problems in the chain. Therefore, reporters can easily follow all the transactions and find the bottlenecks in the performed processes. Some robots can even create reports. If the robots perform all transactions, there won't be any dangerous work combinations. This will make auditors work easier. (Slaby 2012) However, RPA is quite new field of study and it is possible that regulations are not up to date. It will be interesting to see, how regulation regarding the use of robots change in the future and how auditors will respond to use of robots.

Compared to traditional IT solutions, robots are usually cheaper and easier to use. This is mainly because of the lightweight solution used in the robot functionality.

Robots consist of reusable components that can be easily transferred from one robot to another. Components can be modified individually and saved in a library. Over the time, these components can be reused. Use of RPA has also reduced the dependence on IT, because the units themselves can perform most of the tactical requirements. (Slaby 2012)

Use of digital workforce depends on the company and the situation. It is important to analyse different tasks and processes in a company before the robots are taken into use. In the analysis phase, it is also important to consider other automation options because in some cases, it is possible to build automation tools into the existing systems. Essentially, deviation between the tasks that could be performed by the existing technology in the company and tasks that could be given to the robots is needed.

3.6 Limitations and risks in use of RPA

Even though RPA is described to be cost effective and time saving options for process automation (Srivastava, Block & Campus 2006), there are few limitations and risks that need to be taken into account. For example, robots need more explicit information than humans. This highlights the role of training. Singh (1988) has stated in his research that automation could reduce human workload if it is well planned and designed. They have also stated that training is perhaps the most important issue in successful adoption. Essentially, this means that if the training is not implemented in an optimal way or the training is implemented wrong, the robot will perform all the tasks systematically wrong. Bainbridge (1983) and Wiener (1988) have supported this statement by saying:

*"Level of automation could leave an operator bored is, perhaps, understandable, but that automation can increase workload is one of the ironies of automation."
(Bainbridge, 1983)*

"If automation is implemented in a "clumsy" manner, workload reduction may not occur where it is most needed" (Wiener, 1988)

There could also be problems with the validity of the base data. As mentioned, cognitive skills of the robots are not that advanced yet. This means, that as far as the base data is wrong, the robot can't process it. In the worst case, robot performs the task but it performs it wrong. This is why strict control of the received data is needed. Also, the management of the group of robots have to be taken into consideration. While robots are performing the tasks based on training, there have to be employees who take control over them. If some of the performed processes change, the robot needs to be trained again. (Parasuraman & Riley, 1997; Miller & Parasuraman 2007)

Thirdly, RPA is a tool among other process improvement tools and organization has to grow in pace with automation. This means, that it is not possible to gain all the benefits if the used technology is not suitable for the robots or used technology is too old. Companies has too keep up with the development of IT or otherwise they might lose the advantage that robotics are designed to offer. This reflects also to the employees. Raise of automation will create new jobs and change job descriptions. This will require continuous training of employees and learning inside the company. There are studies that argue about the future of accountants. Some studies have argued that the accountant's job will disappear in the future. (Keenoy 1958) However, because of continuous IT development, it is more probable that only the tasks and processes will change. Firms will need accountants since they are the ones who have been trained to manage this continuously changing technology.

Fourthly, one major concern regarding the growth of automation and RPA is in attitudes and feelings against automation (Lee & See 2004). Parasumaran and Riley (1997) have stated that usually these are concerning the reliability and accuracy of the automation. However, these attitudes vary widely among individuals. According to Parasumaran's and Riley's research (1997), people usually trust for example automatic breaking systems when driving on icy roads but general feeling is most commonly suspicious. Especially elderly people tend to be more suspicious against automation. In order to develop and boost new automation technologies, people have to trust in them. There are also concern and fear that automation will replace the

human work force in the future. However, it is possible that some jobs will disappear, but in contrast the automation will create new jobs as well.

Lastly, so-called out-of-the-loop problem (Endsley & Kiris 1995, Wickens 1992, Wiener and Curry 1980) has caused concern in companies. According to the Wickens (1992), systems working with automation have restricted ability to detect system errors. Furthermore, ability to perform tasks manually in case of errors is disappearing. Endsley & Kris (1995) have found that people, who had been in initial training but not operated in manual tasks, performed the tasks worse than people who had operated only in manual tasks. This means that when errors occur, there might be problems replacing the system manually. Findings show that loss of manual skills is really happening and something need to be done to prevent this.

3.7 Summary of theoretical part

In the theoretical part of the work, a closer look to previous literature was taken and indirect procurement process was defined in detail. RPA was also presented as a tool for better indirect procurement management. The purpose was to create a good theoretical basis for empirical part of the work. Findings from the theory are also exploited in the empirical part of the work. Figure 5 below summarizes the linkage between the different parts of the theory.

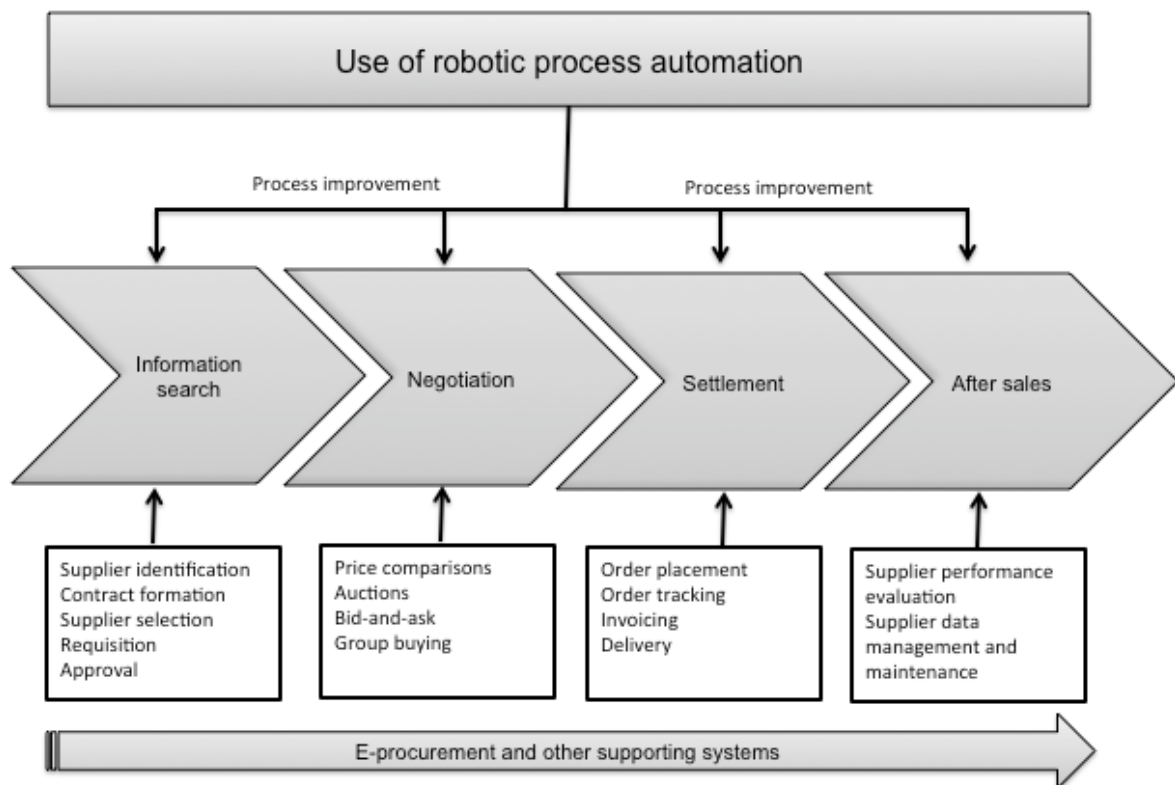


Figure 6: Summary of theoretical part

As it can be seen from the figure 6 above, procurement process starts with the information search and ends up to after sales. Information search includes tasks such as supplier identification, contract formation, supplier selection, requisitions and order approvals. Negotiation phase instead, may include price comparisons, auctions or other negotiation mechanisms depending on the purchaser. In settlement phase purchase orders are placed and order tracking is performed. In this phase, the supplier sends the invoice for accounts payable personnel and purchaser follows the delivery. When the invoice is processed, and paid and the items are received, begins after sales phase. In this phase company evaluates supplier's performance. Because the supplier information is saved in the company's databases, the firm also has to manage and maintain the databases afterwards.

In the case of indirect supplies, usually e-procurement systems are involved. These systems enable better indirect procurement management by restricting buyers to use any supplier they want. With e-procurement systems it is also easier to manage

the data since it is gathered in one place. As a result, continuously expanding supplier databases will decrease and purchasing professional can control buying better. Also, level of automation will increase. However, not every firm has systems behind indirect procurement. In this case, purchasing data is spread into buyers' personal devices and software such as email, cell phones, desktops etc. and it is only entered to firm's systems when invoice arrives. Of course, this reflects to firm's invoicing process efficiency. Workload in accounts payable teams will increase because they need to create new vendors continuously and process invoices with new information. This is also the case in this thesis and that is why RPA is introduced as a tool for better indirect procurement management.

As the figure 5 above illustrates, RPA is a tool that can be used in different parts of a business processes. However, as mentioned in the literature, implementation will require deep analysis of firm's tasks and processes. Therefore, theoretical part was intended to describe RPA as a tool in general and point out possible success factors for the implementation. These findings are used as basis for creation of the empirical part.

4 EMPIRICAL RESEARCH: UTILIZING RPA IN PRACTICE

Empirical part of the work is carried out with case study method. Case company of this thesis is a major player in the Finnish food industry. Company operates in eight countries and exports its products and services over 40 countries. In 2016, group employed over 14 000 people and its turnover yielded over 1,6 MRD€. Profitable growth and continuous business development have been in company's interest many years and it will continue even stronger in the future.

Digitalization has been huge part of case company's growth and development. However, continuously changing IT environment, has changed business processes dramatically and forced employees to adapt new ways of doing business. Therefore, it has not been an easy task. Particularly, financial services have experienced a major change in recent years. Thoughts about paperless office have been literally put into practice. New systems, applications and software are taken into use in order to make business processes more efficient. Yet, transformation has not yet stopped. Since most of the tasks and processes are turned into electronic format and placed in different systems around the company, next step is to increase level of automation and even adapt totally new technologies such as RPA and artificial and cognitive intelligence based technologies.

In 2017, case company has started to focus more on its process efficiency. In this thesis two main targets are examined in detail: indirect procurement and automation of invoicing. First development target is indirect procurement. Company has realized the financial potential that is arising from that fuzzy group of supplies. In case company, total spend is about 61 % of turnover and share of indirect supplies is approximately 20 % of turnover. This means, that around 320 million euros are spent in indirect supplies every year. In case of direct supplies different systems are used to manage and control the group. Therefore, the process is quite efficient already and level of automation is high. The same can't be said of indirect supplies. According to group's sourcing director, there are no systems behind the indirect supplies. Data and materials are located in the buyers' personal devices such as email, desktop or

other application. Only when invoices arrive, the data is recorded in firm's invoice processing system and further in the other systems such as SAP. Practically, this means that buyers can purchase items from any supplier they want. This instead, increases supplier databases as well as manual work at the accounts payable team. Company clearly need a new system for indirect supplies to restrict and control purchasing. While the new procurement system is under consideration, firm's shared services department have taken one step further.

Company's external accounting is concentrated to financial shared services. Shared services department is a unit that is responsible for firm's external accounting as well as human resources, IT and facility services. More in detail, financial services are responsible for company's accounts payables and receivables, cash management and general ledger accounting. As it was pointed out in the theory, RPA have been recognized to be suitable option especially for shared services (Lacity et al. abc). In the case company, this is also the case. Due to the high volume and time-consuming tasks and routine work, the firm has started to investigate possibilities for the use of RPA in shared services' processes. RPA project were introduced at the company for the first time at the beginning of 2017. During the year, different teams are going through the tasks and processes that could be suitable for the adoption of RPA. At the end of the year, RPA provider will create three test robots from the predefined processes.

4.1 Data collection

Data for the research is gathered with two separate interviews. Also, additional material such as financial statements, process descriptions and account information are used to support the results. Both interviews were recorded and transcribed for the analysis. Interviewees were selected to this research based on their knowledge regarding the subject. Also, their positions and responsibilities in the indirect procurement process are taken into account. Because the main purpose of this study is to investigate how RPA can be utilized in indirect procurement process, it was also seen important to gather data from two different perspectives: purchasing department's perspective and shared services' perspective. Therefore, director from

the group sourcing and employees from the accounts payable team were selected to the interview. It was thought that, two different perspectives could provide results more in detail and from different stages of the process. By interviewing not only people from shared services but also from group sourcing, it was possible to gather detailed data regarding indirect procurement as well as invoicing process. Selected interviewees and their contributions to the subject are presented below.

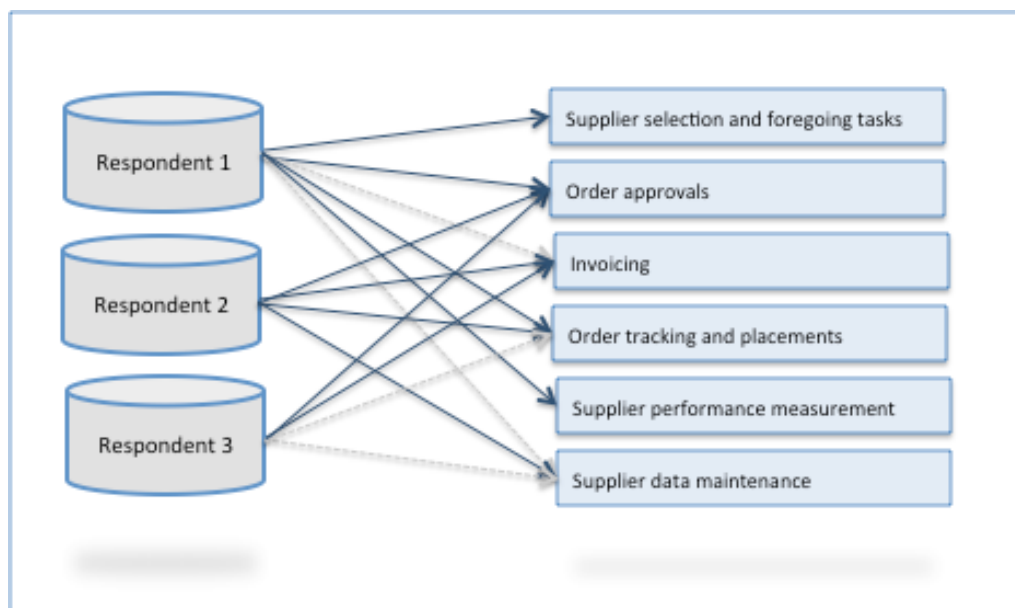


Figure 7: Presentation of interviewees

As it can be seen from the figure 7 above, interviewees are named as follows: *Respondent 1, respondent 2 and respondent 3*. Respondent 1 imply the director from group sourcing. She has good knowledge of indirect procurement in general in the company. She also knows a lot of vendor selection, performance measurement and pricing. She was selected to the interview because she could describe the current issues in the order-delivery process and especially in indirect procurement.

Second respondent 2 is the manager of accounts payable team (figure 7). Even though she does not work with invoices in practise, she is familiar with the processes. Respondent 2 is also participating group's projects and her work is to develop invoicing process. Therefore, she could give a broader view of current invoicing process performance. Third respondent 3 is currently working as an accountant

in accounts payable team. As an accountant, she could describe both, invoicing process in general and the specific tasks in invoicing process that could be delegated to digital workforce. Because respondent 3 is working with invoicing process in practice, she is also able to give some real-life examples of the current problems in the order-delivery chain. She could also give us first-hand information about the time-consuming routine tasks that need to be developed. Respondent 2 and 3 are both working in the firm's financial shared services.

Both, respondents from shared services (respondent 2 & 3) are also familiar with RPA. As mentioned, case company is investigating the possibilities regarding use of RPA in shared services. Therefore, they had determined their processes beforehand and gave examples regarding tasks that could be automatized with RPA. They also had had education regarding RPA from the RPA provider company.

Both interviews were half-structured and findings from the theoretical part were used as help in creation of question pattern and support the results. Based on the findings from theoretical part, 6 main steps for procurement process were pre-defined for the interviews. Because these main steps were given, it was possible to drill into tasks more in detailed. Secondly, success factors for adoption of RPA were examined in the theory. Interviews were built in so that it was possible to reflect the answers to these success factors. It was possible to compare, whether the given task meets the requirements for successful adoption or not. By reflecting the answers to pre-defined process attributes -that were examined by multiple researchers- it was possible to provide more reliable results.

Main steps in indirect procurement process were adapted from the four-stage model that was discussed in the theory. According to four-stage model procurement process includes at least following steps: Information search, negotiation, settlement and aftersales (Kim & Shunk 2003; Presutti 2003; Gebauer & Scharl 1999; Kraut et al. 1998; Cousins et al. 2008, 60-61). In the question pattern, these four main steps were split even more detailed steps. Theoretical part showed that at least 6 steps could be found:

- 1) Supplier selection and foregoing tasks
- 2) Order approvals
- 3) Invoicing
- 4) Order tracking and receiving the order
- 5) Supplier performance measurement
- 6) Supplier data management and maintenance

By dividing the procurement process in steps above, it was easier to place current problems in different parts of a process. It was also easier to investigate in which parts of the process problems occur and in which parts RPA should be used.

In theory it was also stated, in which tasks robotic process automation should be used and in which tasks it will work in an optimal way. Based on the information provided by the Lacity et al. (2015a) and Slaby (2012), eight attributes were selected to measure the degree of RPA suitability in indirect procurement process. In the table 4 below, selected attributes are listed and direction for recommended value is presented. There are also attributes in which the direction can be both, low or high. In these cases, the direction will depend on situation and task in the company.

Table 4: RPA process attributes (Adopted from Lacity et al., 2015a & Slaby, 2012)

Selected attributes	direction for recommended value
1. Volume of transactions	high
2. Degree of process standardisation	high
3. Degree of regularity	high
4. Degree of maturity of the process	high
5. Degree of used systems and applications in the process	high
6. Process complexity and need for human intervention	low
7. Significance of process failure for the company	low/high
8. Value of the process	low/high

Shortly, volume of the transaction means, that there is a lot of repetition and a lot of data included in the processed task. This could mean for example amount of time spend per day or month to complete the task. Degree of process standardisation

instead, means the degree of exceptions in the process. If the process includes a lot of exceptions, the training of the robot will be difficult or even impossible. Therefore, processes should be as standardized as possible. Degree of regularity instead means rules according to which the task is completed. Robots are trained according to rules, which is why high regularity would make the training easier and functionality more secure. Degree of maturity implicates the functionality of the process. Usually mature processes are well described, organized and measured. Process complexity and degree of human intervention means that there should not be any grey areas in the process that require special skills and deep analysis. As mentioned, robots are not intelligent. They can only do what they are taught to do. However, robots are especially good at finding things from different applications and systems. They are easily taught to access in different systems while it would be difficult and more expensive with traditional IT solutions. Significance of process failure means costs that the mistake may cause for the company. Value of the process instead, means how much employees time the task takes in a day or month or how costly the task is for company. (Lacity et al. 2015a; Slaby, 2012)

4.2 Analysis

This research is analysed using the inductive content analysis method (chapter 1.4). According to Elo and Kyngäs (2008), this method includes three main steps that need to be followed: pre-processing, categorization and abstraction. These phases and the research process are described in figure 8 below.

In the pre-processing phase the target phenomenon "*Utilizing RPA in indirect procurement process*" is described at general level. Purpose is to describe the cost structure in the case company and current state of indirect procurement process. Also, the process phases in which RPA could be used at the target company are described at general level. This stage will prove, whether the shared services is the optimal target for adoption of RPA or not. In the categorization phase, the data is re-organized and grouped according to related subjects. As it can be seen from the figure 8 below, this thesis contains three main categories: 1) *In which tasks RPA could be used?* 2) *What are the incentives that drive companies to adopt RPA in*

business processes? 3) What are the disincentives and limitations for the adoption of RPA? In the abstraction phase, these three main categories are investigated in so, that even smaller sub-categories could be found. As it can be seen from the figure 8 below, these sub-categories are: Purchasing, invoicing, data maintenance, benefits, opportunities, motives, challenges, limitations and risks. At the end of the abstraction phase, results are presented.

Data is analysed inductively, which means that analysis process and reasoning starts with a single observation, case company. However, as mentioned in the chapter 1.4, there are some limitations regarding the generalization of results in case studies. Therefore, theory is used to support the result and generalization. Purpose is to reflect the results to theory and find similarities from the previous studies.

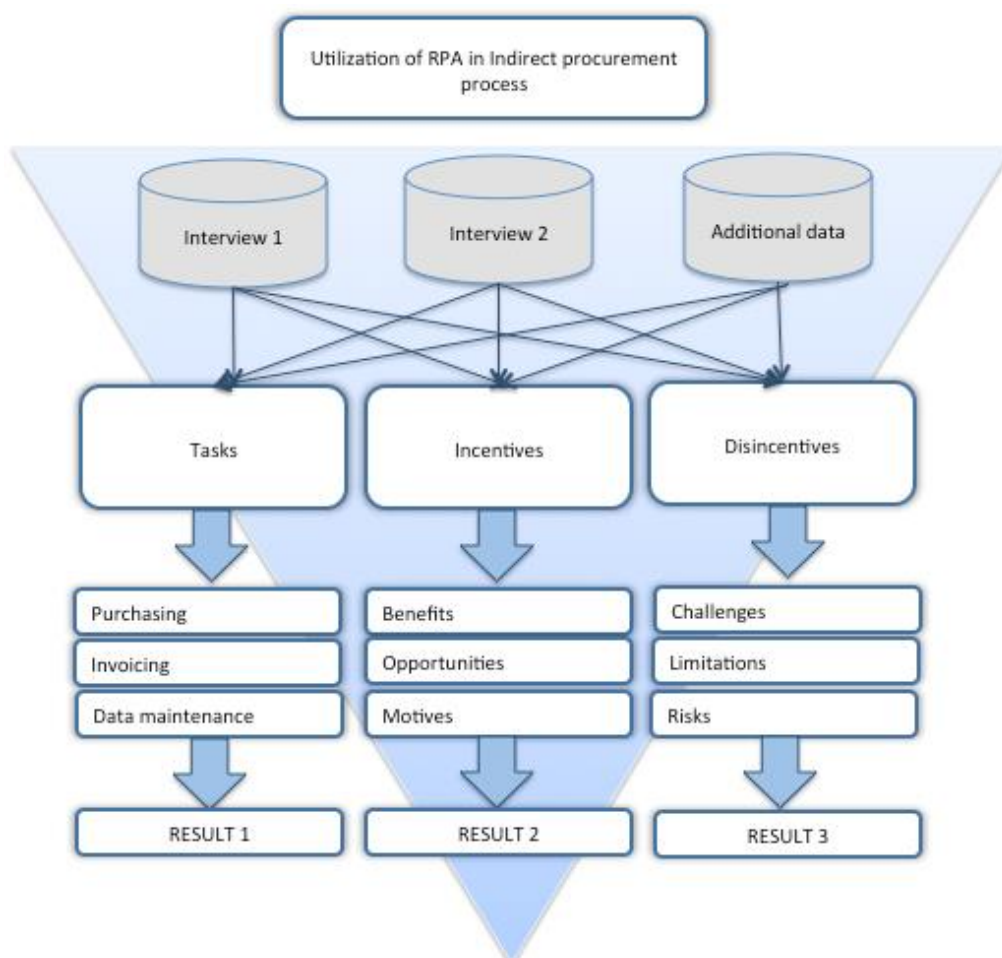


Figure 8: Description of the analysis process (Adapted from the Elo and Kyngäs (2008))

4.3 Reliability and validity

The use of reliability and validity is common in quantitative research but in qualitative research it has gained far less attention (Golafshani, 2003). Furthermore, there has been criticism regarding case study method because generalizability is often unclear. This is due to the data that concerns only single event, the case company. However, even though the gathered evidence is limited, valid and reliable results can be used to support future researches of the subject.

In short, validity measures how well the research questions and the target group respond to research phenomenon. Important question is: Are we investigating the problem that we were intended to? Validity of the results also depends on data gathered for the research. Is there enough data to draw the necessary conclusions? Reliability instead, means repeatability of the results. (Golafshani, 2003) However, as Stenbacka (2001) have stated, in qualitative research reliability can be misleading. If reliability is a criterion, results are usually that the study is not good. Especially with case studies, this is often a problem because results are bound to the environment and situation in the case company during the study. Therefore, the most important criteria for the reliability of qualitative research is the researcher itself.

In this thesis, the reliability and validity are measured via verification strategy discussed by Morse, Barrett, Mayan, Olson and Spiers (2002). According to Morse et al. (2002), strategy that ensure both reliability and validity of the data, includes five steps: *methodological coherence, sampling sufficiency, developing a dynamic relationship between sampling, data collection and analysis, thinking theoretically, and theory development*. Aim of methodological coherence is to ensure congruence between research problem and the method. This means that question, method, data and the analysis need to be in balance. Secondly, sample must be appropriate which means that respondents must have the best knowledge of the topic. In this research, case study was selected to the research method because subject is quite new and respondents need to be familiar with the subject. Furthermore, as stated in the chapter 4.1, interviewees were selected carefully. Thirdly, there must be mutual interaction between empirical and theoretical part of the work. As in this thesis,

theoretical part explains, what is already known about the subject and empirical part tries to fulfil the gap of what is not known yet. Theoretical part is also created to support the results' validity. Fourthly, thinking theoretically means that new idea rising from the data must be verified in the data already collected. Therefore, in chapter 6.1 the connections between the theory and the research are discussed. Lastly, theory is developed moving deliberately between the micro and macro perspectives of the data. (Morse et al. 2002)

By following these five steps, reliable and valid results can be achieved. In this thesis, these steps are followed as closely as possible. By doing so, results can be said to be both: as valid and as reliable as those can be in qualitative case study. However, it must be pointed out that only three employees were interviewed in this study and it limits the validity and reliability of the results.

5 RESULTS

In this chapter, data is processed using the content analysis method as mentioned in chapter 4.2. First, utilization of RPA in indirect procurement process is described in general. Cost structure and the current state of indirect supplies in the company are described and the indirect procurement process is presented. Secondly, tasks in which RPA could be utilized are analysed. Thirdly, incentives and disincentives to use RPA are discussed. At the end of the chapter, results are brought together and summarized.

5.1 Current state of indirect procurement at case company

According to respondent 1, group's purchasing has been approximately 61 % of the total turnover during the 2016 and around 35 - 40 % of them have been categorized as indirect. Compared to Cox et al.'s (2005) research, results are quite in line with other manufacturing firms. Their result showed that direct spend in manufacturing firm's is average 69,9 % while indirect spend is average 31,1 %. However, indirect spend in the case company seems to be a little bit higher than the average.

Direct supplies in the firm include for example raw materials and packaging materials. Raw materials include ingredients that are needed to prepare the food. Packaging materials instead, include for example wraps, plastic bags and cartons in which the food is placed when it is ready. Approximately 99 % of all direct materials are included in raw - or packaging materials group. Also, some of the supporting materials (e.g. pallets) and presentation materials (e.g. stands in stores) are defined as direct. (Respondent 1) Essentially, everything else belongs to indirect materials. Deviation of indirect supplies is huge. Biggest groups according to interviewee 1 are logistic, IT, maintenance, HR services, marketing and communication. Logically, huge amount of different account groups indicates even bigger number of suppliers. In accounts payable department, the number of invoices is not the issue, but number of suppliers is because it takes more time to process invoices from new vendors. Currently company has thousands of vendors created at the database company-wide and number is continuously increasing. This problem cause both, problems in

postings and problems in data maintenance. Respondent 1 sums up the problem by saying:

"We have thousands of vendors there and definitely, we are not buying from every of them every year!" (Respondent 1)

"We have so much data in our systems and manual cleaning doesn't bring any value to the company. And of course, retention of data is also a cost for the company." (Respondent 1)

Respondent 1 also said, that the problem is that they don't have any control point in order-delivery process. Because there is no system behind the indirect supplies, buyers have possibility to use any vendor they like. This reflects to level of automation in the indirect procurement process. As far as the data is not in the systems, traditional automation tools can't be used.


In the interview, respondent 1 was asked to describe different tasks in the indirect procurement process. Based on the descriptions, tasks were rated in ordinal scale 1-5. Value 1 means that RPA can't be utilized in given task. Number 5 instead, means that RPA is recommended to use in given task. Therefore, the bigger the total the better the suitability to given task. As it can be seen from table 5, results support the idea of utilizing RPA especially in shared services. In fact, order-delivery process, invoicing and monitoring were only phases in the indirect procurement process in which RPA could be used according to the kept interviews. (Table 5)

Regarding tasks related to supplier selection and foregoing tasks (table 5), respondent 1 stated that they first specify the need for new purchase (e.g. new packaging machine) together with business unit. Secondly, they need to specify the requirements for the machine (e.g. technical issues) and create requests for proposals. After that, group sourcing together with business unit will analyse the results. As it can be inferred from the task description, this is the phase in procurement process that requires a lot of human intervention and deep understanding of the subject. Respondent 1 also stated that need for indirect supplies usually vary because the

time between the purchases is long. Therefore, each buying decision is unique. If these results are reflected to the RPA success factors (table 4 & table 5), it can be stated that supplier selection and foregoing tasks won't fit for the option of RPA. Another phase that didn't seem to fit for RPA was supplier performance measurement. As the respondent 1 stated, they measure the quality for example by keeping meetings with suppliers and following key performance indicators such as level of service quality in cleaning and customer satisfaction. This will require a lot of human intervention and interaction with other people. Especially meetings and negotiations are tasks that are difficult or even impossible to outsource for robots.

However, supplier selection and foregoing tasks together with supplier performance measurement seemed to be only tasks in which RPA could not be utilized in an optimal way even though the tasks were determined at general level. These were also only phases in the process that clearly involved purchasing professionals in the process. As it can be seen from table 5, tasks that could be performed by RPA are approval circulation, invoicing, order tracking and receiving the order as well as supplier data management. These are tasks in which shared services is involved. (Table 5)

Table 5: Suitability of RPA in indirect procurement process

		PROCUREMENT PROCESS 					
		Supplier selection and foregoing tasks	Order approvals	Invoicing	Order tracking and receiving the order	Supplier performance measurement	Supplier data management and maintenance
SUCCESS FACTORS FOR ADOPTION OF RPA	Volume of transactions	3	5	5	5	3	4
	Degree of process standardisation	2	4	4	4	3	5
	Degree of regularity	2	5	5	5	3	5
	Degree of maturity of the process	3	4	5	4	3	4
	Degree of used systems and applications in the process	3	5	5	3	3	3
	Process complexity and need for human intervention	1	5	4	4	1	5
	Significance of process failure for the company	1	4	4	5	2	5
	Value of the process	1	3	4	3	3	3
TOTAL	16	35	36	33	21	34	

As it was stated, supplier selection and supplier performance measurement are phases in which, RPA is not recommended. Therefore, these phases are left out from the further research. However, this general overview proves that there are potential for RPA in shared services. Therefore, next chapter will take one step further and investigate these particular phases in the process and point out tasks in which RPA could be used at practical level. Last chapters instead, will focus more on motivations and feelings toward RPA and limitations and challenges what company may face.

5.2 Tasks in which RPA could be utilized in practical level

According to kept interviews, multiple tasks related to RPA adoption can be found. First, all interviewees agreed that data maintenance and monitoring are potential targets for RPA. Respondent 1 mentioned that they have huge amount of data in their systems and manual cleaning won't bring any value for the firm. She also stated that maintaining that data is of course a cost for the company. Respondent 2 and 3 also mentioned that in accounts payable team, huge part of the work is only updating, monitoring and maintaining the data at the company. Respondent 2 and 3 for example stated that:

“We also need to update the master data. We need to check where the data comes from and update it when needed.” (Respondent 2)

“And then we have a lot of other information that we need to update to keep invoicing running. We need to do a lot of work that contains checking information from different systems like Workday, Intranet, Basware and SAP because the received data is rarely completely correct.” (Respondent 3)

Respondent 2 stated that the robot could for example check the vendor data every time when new vendors are founded. This could ensure that the vendor data is compatible and harmonized companywide. The robot could for example fulfil the pre-determined fields and inform accountants when it is created. Respondent 2 also

stated that the robot could perform check runs for the data and inform authors if there is something that needs to be corrected or updated.

Secondly, RPA can be used in vendor creation. Interviews showed that indirect procurement increases supplier databases. This instead, means that work in vendor creation increases as well. Respondent 2 stated that the robot could be taught to gather information from the invoice. Therefore, the robot could go through all the new vendors in the invoicing processing system, read the invoice and insert the required data in the correct fields in SAP. After the vendor is created, the robot can send a message to author and inform that it is done. However, as respondent 2 stated, this can't be automatized completely for safety reason because after the supplier has been created, invoices are processed and paid regularly.

As mentioned, robots can be taught to send emails to specified people after the completed tasks. Therefore, they can also be taught to remind approvers. Respondent 3 stated that one problem in the invoicing process is that invoices get "stuck" in the approval circulation. This is due to the fact that approvers and reviewers don't always remember to check their mail boxes in invoice processing system. The robot could for example remind approvers if the due date is already close. Practically, they could log in the invoice processing system, check all the invoices in the circulation and gather all the invoices in which due date is close. After that the robot could send message to every approver. This action could decrease over dues, which instead, reduce reminders and work in accounts payable team.

What comes to an actual invoice processing, results are manifold. Probably the most significant finding is that the robot can read the invoice and make the postings and corrections for the base data. For example, respondent 3 and 2 stated:

"It would be really good if the robot could pre-process the invoices in so that the invoice data is correct. It could for example check the bank accounts, payment terms and other information that they are correct." (Respondent 2)

“And I think that the robot could double check that the input base data is correct. Now there might be mistakes in scanning for example. If the robot double checks that data, it could decrease the number of human mistakes.” (Respondent 3)

This could be time saving for accountants because then they don't have to double-check the data anymore. Moreover, it was discussed that the robot could make the postings for the invoices as well. The robot could for example use pre-defined accounts for certain suppliers. The robot could also search the necessary cost centres based on invoice data. Respondent 2 said that sometimes they need to search cost centres and approvers from the separate excel files. This is something that is possible to perform with robots. As Lacity et al. (2015a) stated, robots are created to search information from different systems. In fact, this could be helpful especially when processing indirect invoices because those are usually unclear and the separate excel files are maintained.

Both respondents also emphasized that they have a lot of time taking mass invoices. These are invoices that are always posted in a same way. Therefore, these mass invoices could be taught to robots completely. In fact, this could release accountants' workload significantly. According to respondent 3, at least fifth of daily invoices could be automatized:

“I calculated that we have about 200 mass invoices per day that can be directly automatized. It is about 20% of total invoice amount per day and therefore it is kind of scary to think that fifth of our work can be performed by machine!” (Respondent 3)

However, respondent 2 responded that this is something that could be also built in their new invoice processing system. She said that the new system can read the information from the invoice and make the postings as well. But there are some limitations in that system when the complexity of the invoice is considered. Respondent 3 for example stated that the systems can only process invoices with one account. If invoice requires two or more accounts, system can't perform it anymore. In that case, RPA can be utilized.

Lastly, it was found that there are tasks related to month end closing, which could be taught to robots as well. For example, reconciliation of accounts, currency run and monthly accruals to profit and loss. Robots could perform especially different kinds of automated postings such as mentioned currency run, because these are done in a same way every month. For example, the robot can be taught to run these transactions in specific days and in specific time. Reconciliation instead, is optimal for RPA because robots are good “finding things”. Therefore, at the end of the month, the robot could for example perform the reconciliation of internal balances between accounts receivable and payable teams. Purpose of the reconciliation is to find internal sale invoice from the groups subsidiary 1 and corresponding internal purchase invoice from groups subsidiary 2.

5.3 Incentives to adopt RPA in business processes

Previous studies have shown that, robots release expensive human resources in to better use and they are tireless and efficient because they can work 24 hour per day. Robots have also improved monitoring of processes because every action can be recorded. As for more, RPA as a solution is considered to be cheaper than other automation tools and IT devices. (Slaby 2012) Findings from the kept interviews support previously mentioned benefits but also suggest new benefits and motivations behind the adoption of RPA. In this chapter, incentives for RPA are discussed through three topics: Benefits, opportunities and motives.

Benefits

First, during the interview, both respondents 2 and 3 mentioned that they will benefit from the RPA’s recoding function. This is also related to RPA’s flexibility to operate across the company. Once the task is taught to one robot, it can be re-placed in company’s other processes. For example, if robot is taught to check supplier’s existent, the same task is possible to transfer accounts receivable team, when they need to check customers existent. Respondent 2 also mentioned that probably they don’t have enough tasks to one robot, even though the volumes are high. Therefore,

it is beneficial that the same robot can perform different tasks companywide. Respondent 2 also said that perhaps they don't have that much tasks to give for a robot at the beginning, but since they have learned how to operate with them, they can recognize more potential targets.

Secondly, it was found that the RPA challenges the decision to outsource financial processes and services abroad. Respondent 2 stated:

“I think it is important that the learning and knowledge remains at the company. Other companies have outsourced their routine works abroad to lower labour cost countries and now they are pulling them back because it wasn't that easy to manage people in other countries after all. When we have this robot, we can follow the work continuously and we know exactly the logic behind the actions.” (Respondent 2)

This also means that the robots are easier to control and manage because they are performing the tasks exactly as they are taught to. Therefore, the logic behind the actions is clear. Company has possibility to keep professionals and business processes at the company instead of giving them external providers. At the same time, bigger volumes can be managed with fewer expensive human resources.

According to interview, indirect supplies cause a lot of manual work for accountants. Therefore, possibility to mistakes increase too. Both respondents 2 and 3, stated that RPA could provide more reliable data by decreasing human errors. Respondents mentioned that the robot could for example compare the invoice data and input base data to each other. In this way, possible mistakes for example in due dates and bank accounts can be tracked and corrected. Better data quality instead, will lead to increased customer satisfaction.

In the interview, respondents emphasized that currently the quality of the data is poor. There are a lot of mistakes and different ways to perform the tasks. Now, when RPA will be taken into use, the quality of the data will increase and business processes will be harmonized. Because RPA is vulnerable for exceptions, it forces

companies to harmonize processes. This instead, enables more standardized ways to manage fusions and mergers for example (Respondent 2). Furthermore, standardized processes will simplify accountants' work since there are no different instructions for different subsidiaries anymore.

Lastly, it was found that even though huge part of invoicing can be automatized using the existing technology and solution that are built in the systems, complexity of transactions can set limitations for that. Therefore, RPA can be considered more flexible.

Opportunities

By utilizing the RPA in the case company, it is not only benefitting it but also creating opportunities for the future. Respondent 2 stated that she is worried about the volume in the company. Is it enough for optimal use of RPA? However, while analysing the interviews, it can be recognised that there are multiple tasks that could be taught to one robot. Therefore, even though the volume for one task is not enough, there are a lot of other things that robot could do companywide. Furthermore, once these tasks are taught to that robot once, these can be copied to other robots in case of volume increases in the future and one robot is not enough anymore.

Utilizing robotics in business processes also creates new job opportunities for employees. When respondents were asked, whether they believe that their job will change in the future, respondent 2 and 3 answered:

“Yes, I think it will change. Perhaps it will be more like managing and monitoring the data and the processes. And checking that the robot performs the tasks as it should. Perhaps we have more time to focus on problems as well.” (Respondent 2)

“Yea, it will be more like administrative work.” (Respondent 3)

Because RPA will release employees' time, perhaps they could use it to something more valuable for the firm. At the case company one huge problem was that the quality of the data is poor. Therefore, employees would have more time to focus on this issue and fix it. This will be also the requirement for complete adoption of RPA because as far as the data in the invoice is wrong, the robot can't process it correctly.

Lastly, respondent 3 mentioned that perhaps in the future, there might be even more advanced robotic solutions in the markets. If that is the case, companies that already use robotics at some level will adopt those new solutions more easily than firms who have no experience at all because the background jobs are already completed. Background job means that processes have been harmonized, streamlined and clarified. For example, RPA forces companies to re-organize their processes to get RPA work. Once this is done, it is easier to adopt new solutions in the future. However, any solution will require changes in the company.

Motives

Motives behind the adoption of RPA are clear at the company. First, this kind of solution fascinates employees because it is something that hasn't been seen before. When respondents were asked whether they like the idea of using robots in business processes, the answers were as follows:

"I think this sounds super good! Definitely, I will see more opportunities than challenges." (Respondent 1)

"I think this is opportunity for us. Definitely. It is good to be pioneer and see how this really works." (Respondent 2)

"It is really interesting to see this robot in action. Now it is difficult to imagine it because it is not like my vacuum cleaner Roomba at home. Perhaps I consider it more like a software." (Respondent 3)

Secondly, according to respondent 3, RPA could release expensive human labour into better use, which is of course good for both: Employee and employer. Employees can focus more on analytical tasks that require professional skills. Employer instead, gains better results because employees role at the company bring value for the company more than before. According to respondent 3, external financial services is also natural way to start the use of robotics because there are a lot of tasks that are based on rules and volume.

Thirdly, robotics is clearly more than just interesting and cost saving option. It is a continuum for technological development. According to interviewees, it is better to be pioneers than late because then the company has head start to robotics when it really expands worldwide. Thus, it seems that RPA is still at early stage. As respondent 3 stated: "Maybe this is a little bit too early for us because we need to get our data in order first. However, if we start fixing it now, we are ready when it really expands."

5.4 Disincentives and limitations to adopt RPA in business processes

In the last chapter, incentives to adopt RPA at the case company were discussed. However, it is also important to consider disincentives as well. In this chapter, disincentives that prevent the adoption of RPA are discussed through following topics: Challenges, limitations and risks.

Challenges

First challenge, which can be recognised from the interview is related to education. Robot needs to be educated properly because poor education of the robot might lead to incorrect data. As respondent 2 stated:

"Of course, robots can perform the tasks wrong as fast and as accurate as any other tasks" (Respondent 2)

However, as mentioned in the theory education is not an easy task. It will require a lot of repetition and detailed descriptions of the tasks. Of course, employees need to be educated and familiarized to RPA as well. Employees need to know the functionality of the robots and the logic behind them even though it is possible to purchase support outside the company. Without that, employees are unable to find new automation targets for robots and find the problems in the chain once they occur.

Secondly, RPA and digitalization in general will set requirements for suppliers. As respondent 3 stated, e-invoicing is quite new phenomenon in Finland and in other countries, it rarely exists. Respondent 3 stated that there are for example large firms in Sweden who doesn't have resources to take e-invoicing into use. Furthermore, it will challenge small suppliers such as small flower stores to use certain types of invoices.

Thirdly, respondents 2 and 3 mentioned changes in the performed tasks. If the task that the robot is performing changes, the robot must be re-educated as well. This means that the robot and the processes must be followed continuously. This is also linked to maintaining the robot. The firm must decide, whether they educate the people inside the company or whether they buy the knowledge outside the company. Respondent 2 suggested that perhaps they will buy the service outside the company first, and transfer it inside the company when the employees are familiarized with the subject. However, the company must have someone in the company, who is familiar with business processes but also can manage the robot because managing the robot also requires deep understanding of the business processes. Therefore, external consultant is not enough for the company. Consultants know how to manage the robot, but he or she doesn't know firm's business processes that well.

Respondent 3 also mentioned that perhaps accounts payable is not yet ready for the RPA because the background job is not done yet. Subsidiaries have different rules and ways to process invoices and the input data is poor. Therefore, it will be challenging to adopt RPA fully in their processes. Processes need to be harmonized and developed first. This is also the reason for low automatization level in general.

Respondent 3 said that only by fixing the current problems in the chain, huge part of the process could be automatized using the current systems. However, there are parts in the order delivery chain, which can be suitable for the robot even though the processes are not harmonized yet.

Lastly, it was mentioned that the role of approvers will increase in future and implementing that for all of them won't be an easy task. If the level of automation increases, it means that there will be less control points in chain. For example, as respondent 3 said, invoices will be transferred directly to accounting after the approval. Currently, accounts payable team has possibility to check the invoices before it is transferred. Furthermore, the risk for false billing will increase because some of the invoices are processed without human intervention at all.

Limitations

There are also some limitations regarding the use of RPA. One of them is international business. Respondent 3 mentioned in the interview that Finland is one step further in automatization and new technology. In the case company, for example Sweden doesn't use e-invoices and that slows down the development of automatization. She mentioned that e invoicing is something that works in Finland quite well, but in other countries it is still rare. Therefore, other countries might limit the use of new technology.

Second limitation is previously mentioned data quality. As far as the data is wrong, robots or any other automation option can't work in an optimal way. This also causes exception to processed data. As mentioned in the theory, processes need to be simple and without exception (Lacity et al. 2015a). As respondent 3 mentioned in the interview, they need to fix the data first or wait for the more advanced automation solutions, which can process exceptions as well.

Last limitation in the case company seems to be humans themselves. Respondent 3 stated:

“Perhaps we could use automation more than we do now with our existing systems but perhaps people in the companies are little bit scared. Especially in Swedish companies they are scared that they lose control.” (Respondent 3)

According to respondent 3, some companies even try not to automate anything because they fear mistakes. Even though it is more likely that data quality increases due to decreased human mistakes. As respondent 2 stated, the robots will do exactly what they are taught to do. Perhaps companies haven't recognized the significance of human errors yet.

During the interview, respondent 3 mentioned that there is also some uncertainty included in the legislation of robotics because it is rather new field of study. In fact, there is not proper legislation developed yet. Respondent 3 mentioned that at least the auditing targets will change in the future because the possibility for the mistake is rather in the rule that has been taught to robot than in the account data.

Risks

Adoption of new technology involves always risks as well. At the case company, at least three different risks can be recognized. First risk is false billing. Respondent 3 stated that they receive approximately 10 false invoices a year. Usually these are received at summer because thieves believe that summer trainees can't recognize that they are false invoices. Same problem will concern robots. Recognizing the false invoices require visual skills and humanity. Therefore, a lot of rules need to be taught to robot to ensure that they recognize these invoices. According to respondent 2 the font or colour of the firm's logo can differ from the regular invoice and the amounts are bigger.

Secondly, fully automatized vendor creation might be dangerous because of the thieves. If the robot mistakenly creates the vendor that doesn't exist, the company will use the vendor, as it would be regular vendor. Therefore, human intervention is needed at some point and the role of approvers increase. Approvers need to ensure that they have ordered the items in the invoice.

Lastly, there is always a risk for failure in managing robots. Especially if the number of robots increases, and they perform multiple tasks at the company, someone needs to manage them. Chances in the performed tasks need to be recognized immediately or otherwise the robot will continue the task wrong. Especially at the case company this might be a problem because the aim is to use one robot for multiple tasks. Therefore, deep understanding of the robot and processes are needed. Company must plan and document the adoption carefully.

5.5 Summary of empirical part

Table 6 below summarizes the results of this study. Purpose of the result 1 is to give an answer to the first sub-question: "*In which tasks RPA can be used?*" As it can be seen from the table, multiple tasks can be given to the robot at the case company. As a result, abstraction concluded to three sub-categories: *purchasing, invoicing and data maintenance*. In purchasing phase, the robot could help accountants to create the vendors in the database. In invoicing phase instead, robot could be used to send reminders to approvers and to prepare the data for invoice processing. Also, reconciliation of accounts, posting runs and monthly accruals are seen to be suitable tasks for the robot. In the field of data maintenance, RPA could be used to ensure input data correctness and gather information from multiple systems and applications.

From the indirect procurement point of view, especially vendor creation, invoice processing, approval circulation and data finding are tasks that could enhance the process. At the case company, indirect supplies increase employees' workload since vendor creation is manual and invoice processing is slower than with direct supplies. Also, base data is usually incomplete and accountants need to fulfil the missing fields manually. Therefore, RPA solution could be considered to perform especially these tasks.

Result 2 instead, provides an answer to the second sub-question: "*What benefits RPA can provide?*" In this category, abstraction concluded to following sub-categories: *benefits, opportunities and motives*. Table 6 shows that the company could

benefit from the RPA in many ways. By utilizing the RPA, company has possibility to benefit RPA's recording function companywide. Company has also possibility to keep the skills and knowledge at the company instead of outsourcing it somewhere else. Decrease of human errors instead, lead to increased data quality and customer satisfaction. RPA is also the key for harmonized business processes since it forces the company to use rule-based tasks that could be taught to robot.

As a result, by utilizing RPA in business processes, company has ability to release human workforce into better use, improve data quality with fewer human error and even increase customer satisfaction. It also opens new opportunities for the future. Because business processes are already harmonized, new technologies are easier to implement. Company has also chance to improve its' processes and gain value for the firm. Furthermore, adoption of RPA creates new job opportunities for employees since they have more time to focus more complicated and analytical tasks than before. Lastly, RPA is seen rather interesting automation option. Results show that employees are excited about the new technology and they think that it is natural continuum for technological development.

However, there are also factors that prevent the adoption of RPA in case company. Result 3 in table 6 seeks for the answers to the question: *"What risks and challenges are related to RPA?"* As it can be seen from table 6, sub-categories are as follows: *challenges, limitations and risks*. Main challenges are related to current situation in the case company. Currently, company's processes are not harmonized and poor data quality and mistakes create exceptions to the performed tasks. Also, the lack of previous experience of robotics can set challenges for the adoption. In order to educate and manage the robot, employees need to get familiar with it's functionality. Furthermore, it might be that company's customers are not able to respond to technical requirements. Poor base data quality instead, limits the use of RPA. Before the RPA can be adopted, company need to improve its data quality first. Also, action plan for preventing the risks, such as false billing and failure in managing the robot, should be planned beforehand.

From the indirect procurement point of view, especially base data incorrectness and exceptions will be a matter when adapting RPA. In the case company, huge problem was that the base data in received invoices is poor and usually wrong. Therefore, there is a risk that the robot performs the tasks systematically wrong based on the given data.

Table 6: Summary of results

RESULT 1	<i>Tasks in which RPA could be utilized in practical level</i>
Purchasing	Robot to create new vendors in SAP
Invoicing	Robot to boost approval circulation by sending reminders for approvers Invoice processing and pre-booking Base data checkings and corrections (bank accounts, cost centres, payment terms etc.) Reconciliation of accounts Valuation run Monthly accruals
Data maintenance	Robot to ensure input data correctness and validity (check run) Robot to find information from other systems and applications
RESULT 2	<i>Incentives to adopt RPA in business processes</i>
Benefits	Recording and flexibility to use across the company Possibility to keep skills and knowledge at the company Decrease of human errors Increase data quality Increase customer satisfaction Business process harmonization Flexibility in taught transactions compared to other solutions
Opportunities	New job opportunities for employees Increase value of the firm Enhance adoption of new technologies
Motives	Interest towards new technology solutions Release expensive human workforce into better use Natural continuum for technological development

RESULT 3 *Disincentives and limitations to adopt RPA in business processes*

Challenges

- Education of the robot and employees
- Digitalization-level of other parties such as small vendors
- Maintaining and managing the rule-based robot under changing environment
- Un-harmonized processes and exceptions in rules
- Poor data quality and mistakes
- Decreasing control points increase invoice approvers responsibility

Limitations

- Technologylevel of the business partners
- Base data incorrectness and exceptions
- Attitudes and resistance to change

Risks

- False billing and other criminality
 - Failure in managing the robots
-

Based on the three sub-questions below, the answer to the main question can be given. Main research question was: *"How robotic process automation can be utilized in indirect procurement?"* According to the findings, RPA can be utilized in different ways in accounts payable's processes but certain limitations need to be considered before implementation.

Results show that RPA could be utilized especially in time-consuming tasks with high volume. Compared to previous researches of the subject, this was also the case. High volume and data incorrectness were also classified as RPA implementation success factors (Table 4). In this research, tasks such as vendor creation, pre-postings and monitoring were highlighted suitable tasks for the adoption from the indirect procurement point of view. However, these are tasks that could be theoretically performed by the robot but reality in the case company set limitations for that because of the data incorrectness and exceptions in the rules. Therefore, it can be said that from the indirect procurement point of view, RPA is still in the development phase and maybe it is too early to be adopted fully. Still, RPA can be seen

suitable automation option companywide. Because the RPA can be utilized in different tasks across the company, case company can extend the usage to different processes and tasks in different teams.

6 DISCUSSION AND CONCLUSION

6.1 Discussion

Findings from the literature showed that indirect supplies are economically significance group in most companies (e.g. Ellram & Carr 1994; Spekman et al. 1994; Cox et al. 2005). In the case company, this is also the case. While previous studies show that approximately 31 % of manufacturing firms supplies are categorized as indirect (Cox et al. 2005), in case company the per cent is approximately 35-40 %. This indicates that indirect procurement is something that should be investigated more carefully in the future as well.

In the theory, it was found that indirect procurement has gained more attention in recent years and new ways of controlling and managing it has been developed (e.g. Kim & Shunk 2004; Cousins 1999; Trent & Monczka 1998). Especially e-procurement systems are considered to be suitable tools for better indirect procurement management. As it is stated in the chapter 3.1 and 3.2, via e-procurement systems, company has possibility to harmonize indirect procurement processes and gather the data from the supplies. Solution is also seen as a key to restrict maverick buying and other non-controlled free buying from the different vendors. (e.g. Gebauer & Segev 2000; Kim & Shunk 2004, Gunasekaran & Ngai 2008; Davila et al. 2003).

In case company, e-procurement system is also under consideration. In fact, results show that e-procurement system seems to be the key for better data quality and adoption of further automation solutions. Empirical results show that data incorrectness and exceptions in the rules are currently preventing the adoption of RPA in the case company. This is due to the fact that there are no limitations in indirect purchasing. Results show that by investing in new e-procurement system, the quality of the data could increase and amount of exceptions decrease because purchasers' need to use pre-defined catalogues instead of free buying. Because buyers are forced to use pre-defined fields in the system, orders are always done in a same way.

In the chapter 3.2 it was also pointed out that new systems usually include different automation possibilities (Parasuraman, et al. 2000; Sheridan & Verplanck, 1978). Therefore, the company need to balance between the RPA and existing automation tools. As far as the automation can be built in the existing systems there are no point to teach it to robot. For example, in SAP and Basware Invoice Processing System there are built in solutions for automation. Yet, these solutions are usually simpler. Results from the empirical part show that RPA as a solution could perform more complicated tasks than built-in automation tools. It was found that RPA could for example perform tasks that require gathering and combining information from multiple systems. Results also showed that robots can read the data from the invoice and create pre-postings and bookings based on read information.

Furthermore, empirical results support previous findings regarding the adoption of RPA. In chapter 3.4, success factors that enable the adoption of RPA were discussed. According to previous researchers (e.g. Lacity et al 2015abc; Slaby 2012; McIvor et al. 2011), RPA is suitable for routine based, high volume tasks with low irregularity. Processes also need to be harmonized before the adoption. Compared to findings from the empirical part, this was also the case. According to interviewees, e.g. vendor creation and pre-postings could save their time and bring value for the process because a lot of time is spent to these actions. However, before the adoption, base data need to be improved in order to decrease the level of irregularity and harmonize the performed processes. Findings from the empirical part also highlighted the role of education in adoption of RPA. As it was stated in the chapter 3.6, education of the robot and the people will take time and need to be done properly in order to prevent mistakes (Wiener 1988; Cooper et al. 2004). Yet, because the RPA as a phenomenon is quite new, it can be difficult to adopt the robot because there are no best practices and models developed. Therefore, the pilot versions will play a crucial role during the adoption.

One important finding from the theory was that one robot can perform different tasks companywide (Slaby 2012; Lacity et al. 2015abc). Compared to the empirical results this is critical for the company because the indirect procurement is still in the children's shoes due to the previously mentioned missing e-procurement system and

data quality. Because of this cross-functionality, the firm has possibility to adopt RPA in other external accounting tasks before the indirect procurement.

Empirical part also resulted up to totally new findings that can't be compared to findings from the theory. One of them is safety in usage and changes in responsibilities. While RPA is taken into use, the role of approvers in invoice circulation will increase because there are less control points in the chain. If approvers don't review the invoices properly, all false billings will go through the system to the bookkeeping. Increased false billing could be the consequence of the increased automation because robots can't read the invoices as properly as humans. Recognition of the false bill will require visual skills and knowledge about the previous invoices. In theory, it was mentioned that robots need to be trained well (chapter 3.6), but there was no mention regarding the false billing. Because of the false billing and decreasing control points in the chain, it will be interesting to see how legislation will respond to increased automation in the company. As mentioned in chapter 5.4, no proper legislation has been developed yet. Therefore, the adoption will require close co-operation with auditors as well in order to fulfil accounting principles from the legislation point of view.

Secondly, it was found that RPA could be better outsourcing option for company compared to regular outsourcing because the firm can keep the knowledge in the company. As it was mentioned in chapter 5.3, it is easier to manage the robot than the people in different countries. On the other hand, it was also found that robotism and increasing automation level might be scary. Some companies are afraid that they lose the control if there are no as much checking points in the chain as there used to be. This may lead to conflict because while automation tries to decrease human intervention in the process, employees scare that they lose control if they are not involved. This finding supports Lee's and See's (2004) findings that were discussed in chapter 3.2. In their research, it was stated that people are seen to respond automation socially and reason for lower automation level is humans' expectations and trust in automation. Therefore, further investigations regarding the social and psychological factors in increasing automation can be suggested.

Lastly, interesting point that rose from the empirical part was the involvement of other parties in technological development. In empirical part, it was found that degree of digitalization in other parties could limit the adoption of RPA in case company. If customers and suppliers are not able to respond technological requirements, how automation can be developed? It was found that the problem occurs especially in international business when customer and supplier countries are not as developed as the host firm's country.

Even though similarities between the theoretical part and this case study can be found, few limitations should be pointed out. As mentioned in chapter 1.5, the empirical results can't be generalized due to the research method. Results concern only one company, the case company. Therefore, results only support findings from the previous studies and fulfil the research gap in the field of robotic process automation and indirect procurement. Moreover, principles regarding validity and reliability were followed as closely as possible during the research (chapter 4.3). By focusing on the interviewee and case company selection, it was possible to ensure that respondents have the best knowledge of the topic. Also, the mutual interaction between empirical and theoretical part can be found. Theoretical part explains the current issues with indirect procurement and RPA.

It is also important to point out that the RPA project in the case company was only in the planning phase. Therefore, findings are only based on previous findings from theory and interviewees' assumptions, plans and re-investigations about the subject. No real actions have been made yet in the case company. Therefore, it would be interesting to investigate how implementation went and what challenges company faced after all.

6.2 Conclusion

As a conclusion, it can be said that RPA can be utilized to boost indirect procurement process. It was found that indirect supplies burden the workload in accounts payable team since it takes more time to process the invoices. As mentioned in chapter 5.1 approximately 35-40 % of the firm's supplies are categorized as indirect

and it reflects to accounts payable team directly. Every time when new supplier is used, accountants need to create the vendor in the firm's database and find correct posting instructions and approvers for the invoice. Also, the general data (bank accounts, payment terms, invoice numbers etc.) need to be double checked before the invoice is sent to approval circulation. Therefore, RPA could release employees' time to other - more valuable - tasks. It was found that RPA could be used to check the general information from the invoice and even create the postings. It can also be used to create new vendors and monitor the existing data in the database. RPA can be used as a tool to perform all time taking routine tasks with high volume. It can also be used to search information from different databases.

However, there are things that need to be developed before the full adoption. Before the RPA is fully taken into use, accounts payable team need to ensure that the base data is correct. Currently the company is suffering from the incorrect data in the invoice. As far as the data is incorrect, it is too dangerous to use robot for the postings because the robot can't read whether the informed data is right or wrong. The firm also need to harmonize its processes. Otherwise, the teaching of the robot is difficult. Tasks need to be performed in same way in order to optimize the use. Still, even though RPA can't be directly utilized in indirect procurement, it is possible to create the pilot versions for other tasks in the external accounting and adopt the tasks related to indirect procurement afterwards. Results show that there are also other tasks that the robot could perform without massive teaching. Before the full adoption, the robot could be used for example to reconcile accounts, run different transactions in SAP and create new vendors and customers companywide.

Compared to previous studies about the subject, this research presents a totally new tool for better indirect procurement management. Since previous studies regarding indirect procurement have focused on e-procurement solutions, this study took one step further. In previous studies, it is discussed that e-procurement systems could help firms to control indirect spend and boost invoicing process. Furthermore, e-procurement systems could enable the adoption of totally new systems and automation functionalities. (e.g Kim & Shunk 2004; Gebauer & Segev 2000) Therefore - as results show -, perhaps the use of RPA in indirect procurement is too early.

Companies need to get the information in the system first before planning further technologies. Still, even though it might be too early for RPA, this study provides information for future research.

6.3 Recommendations and suggestions for future research

Indirect procurement and robotic process automation are highlighted in this thesis. As discussed in chapter 6.1, similarities between the empirical results and previous studies about the subject can be found. However, the research field is not complete and therefore, suggestions for future research can be given.

Literature review in chapter 1.2 showed that indirect procurement and RPA are both quite new fields of studies. As this thesis showed, the main problem in the case company was the lack of proper systems for indirect supplies. It indicates, that even though firm's have realized the potential that is arising from the indirect supplies, no proper actions have been made. Previous studies have discussed different ways of utilizing e-procurement systems in indirect procurement but these studies have remained at a very general level. Most of the studies have been focusing on functionality of such systems rather than implementing them. Firms need more evidence on how these systems work, how much is the total costs and how to implement these systems in firm's processes. Furthermore, actual benefits and challenges must be made more transparent.

Writing this thesis also showed, that the main problems from the process point of view are usually accumulated to order – delivery process, invoicing and maintaining the supplier data. This is mainly due to the lack of previously mentioned systems. Without proper systems, it is almost impossible to manage that amount of information. Expanding supplier databases slow down the automatization of processes and burdens the whole invoicing process from the order to the payment. However, actual evidence from previous studies was hard to find. Most studies have been limited to concern only the buying phase in the whole process. Buying phase, in which these systems are planned to implement. Therefore, it can be recommended

that future studies consider results also from broader point of view. Perhaps, involvement of external accounting and especially accounts payable department to the researches could broaden researchers view on this issue.

Another suggestion is related to continuously increasing automation level. Referring to Lee's and See's (2004) research about social factors and automation, it can be stated that increasing level of automation will increase uncertainty in the business processes because firm's fear to lose control. Therefore, further research regarding the social factors and level of automation is needed. Future researches could emphasize also the social factors, not only the functionality of the system. This will be important part of the future research in order to develop automation further.

In chapter 6.1 international issues such as degree of digitalization in other parties were discussed. As a suggestion for future research, it can be recommended that researches are broaden to concern not only the target company's possibilities to adopt new technologies but also the impacts on other parties such as vendors and customers. What is the impact on other parties and what kind of actions is required from them?

This thesis showed, that RPA could be used especially in the order-delivery process, invoicing and maintenance of supplier data. However, this thesis was limited to concern only the planning phase of adoption of RPA. Therefore, no actual evidence of the functionality of RPA or successful implementation can be given. In the future, it would be interesting to investigate, how the adoption went and what the actual benefits and challenges were. This kind of research would support the use of RPA in business processes and provide more reliable data for companies who consider the adoption of RPA. Furthermore, it would be interesting to investigate RPA from broader point of view. For example, in which tasks RPA could be utilized company-wide and which tasks employ the robot most.

Lastly, it has been suggested that automation of cognitive activities will increase in the future. This could mean that decision-making, planning and creative thinking could be replaced in the future as well. Perhaps computers could replace human

thinking in the future? Researches on artificial intelligence, neural network and cognitive computers have proved that it would be difficult but not impossible. However, today that kind of automation is rare and automation is limited to tools such as robots that are not intelligent enough to creative thinking. Furthermore, that kind of technology will remain rare perhaps for a long time for now.

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APPENDIXES

Appendix 1

HAASTATTELU 12.5.2017 klo. 9:00-10:00 Director: Group Sourcing

1. Paljonko
 - a) kokonaishankintojen osuus on liikevaihdosta?
 - b) epäsuorien hankintojen osuus on kokonaishankinnoista?
2. Mitä yrityksessänne tarkoitetaan
 - a) suorilla hankinnoilla?
 - b) epäsuorilla hankinnoilla?
3. Kuvaile epäsuorien hankintojen työtehtäviä, jotka liittyvät
 - a) toimittajan valintaan ja sitä edeltäviin tehtäviin
 - b) tilauksen hyväksyttämiseen
 - c) laskutukseen
 - d) toimituksen seurantaan ja vastaanottamiseen
 - e) toimittajan suorituskyvyn arviointiin
 - f) toimittajatietojen hallintaan ja ylläpitoon
4. Mihin prosessin vaiheisiin sisältyy eniten kustannuksia? Miksi?
 - a) Mihin prosessin vaiheisiin?
 - b) Miksi?
 - i) Työn suorittamiseen kuluu kallista työaikaa
 - ii) Tehtävä vaatii paljon toistoa
 - iii) Virheiden määrä on suuri
 - iv) Manuaalisen työn määrä on suuri
 - v) Tietojärjestelmiin rakennettua automaatiota ei voida hyödyntää samalla tavalla, kuin suorissa hankinnoissa
5. Mitä toistuvia -tietokoneella suoritettavia- rutiinitehtäviä epäsuorien hankintojen prosessiin liittyy?
 - a) Onko näiden tehtävien volyyymi suuri?
 - b) Vievätkö tehtävät paljon työaikaa?
 - c) Vaativatko tehtävät syvää analyysia ja ammatillista osaamista?
 - d) Suoritetaanko tehtävät toistuvasti samalla tavalla?
6. Mitä ongelmia ja riskejä
 - a) tällä hetkellä käytössä olevien tietojärjestelmien käytettävyyteen liittyy?
 - b) tietojärjestelmien toimivuuteen liittyy?
 - c) tietojärjestelmiin syötettävään dataan liittyy?
 - d) automatisoituihin toimintoihin liittyy?
7. Mitä hyötyjä käytössänne olevalla automaatiolla on tähän asti saavutettu?

- a) suorien hankintojen näkökulmasta
 - b) epäsuorien hankintojen näkökulmasta
8. Minkälaisia hyötyjä ja haasteita ohjelmistorobotiikan käyttöön voisi liittyä?
- a) hyötyjä
 - b) haasteita
9. Miten suhtaudut ohjelmistorobotiikkaan automaatiovaihtoehtona? Minkälaisia ajatuksia tämä sinussa herättää?
10. Mitä muuta haluatte tästä asiasta sanoa?
11. Tiivistetysti, mitkä ovat keskeisimmät ongelmat epäsuorissa hankinnoissa?

Appendix 2

HAASTATTELU 29.5.2017 klo. 14:00-15:00 Manager: Accounts payable, Accountant: Accounts Payable

1. Minkälaisia tehtäviä ostoreskontraan kuuluu?
2. Mitkä tehtävät ovat sellaisia, jotka vievät paljon työntekijöiden aikaa, mutta eivät itessään tuota lisäarvoa yritykselle (eli ns. ylimääräiset ”hanttihommat”)?
- a) Liittykö näihin tehtäviin paljon:
 - i) toistoa?
 - ii) liikkumista eri ohjelmistojen välillä?
 - b) Entä ovatko tehtävät:
 - i) rutiininomaisia / toistuvia?
 - ii) monimutkaisia?
 - iii) virheherkkiä?
3. Miten iso volyyymi ostolaskujen käsittelyssä on?
- a) Paljonko laskuja käsitellään kuukaudessa (kaikki yhtiöt yhteensä)?
 - b) Kauanko yhden laskun käsittelyyn kuluu aikaa keskimäärin?
 - c) Minkälaiset laskut ovat työntekijöille helppoja ja nopeita?
 - d) Minkälaisiin laskuihin kuluu puolestaan paljon aikaa? Minkä takia?
4. Kokonaishankinnoistanne arviolta 35-40 % on epäsuoria hankintoja. Miten tämä näkyy ostolaskuprosessissa?
5. Eroaako epäsuoriin hankintoihin liittyvien laskujen käsittely suorista hankinnoista, kuten raaka-aine ja pakkausmateriaalihankinnoista? Miten?

6. Mitä ongelmia laskujen käsittelyyn liittyy? Mistä nämä johtuvat?
7. Minkälaista automaatiota laskujen käsittelyssä tällä hetkellä käytetään?
8. Yrityksessänne suunnitellaan ohjelmistorobotiikan käyttöönottoa lähitulevaisuudessa. Miten suhtaudutte ohjelmistorobotiikkaan automaatiovaihtoehtona?
 - a) Mikä teitä motivoi ohjelmistorobotiikan käyttöön?
 - b) Mitä ajatuksia se teissä herättää?
 - i) Mikä siinä epäilyttää?
 - ii) Mikä innostaa?
 - c) Onko se mielestänne uhka vai mahdollisuus? Miksi?
9. Minkälaisiin tehtäviin sitä voidaan ostoreskontran näkökulmasta hyödyntää?
10. Mitä haasteita ja rajoituksia tämänhetkiset prosessit ohjelmistorobotiikalle asettavat? Miksi?
11. Mitä muita ongelmia ohjelmistorobotiikan käyttöön voisi liittyä?
12. Entä miten uskotte hyötyvänne ohjelmistorobotiikasta ostoreskontran näkökulmasta?
13. Uskotteko teknologian jatkuvan kehittymisen ja automaation lisääntymisen muuttavan työnkuvaanne seuraavan 10 vuoden aikana? Miten?
14. Mitä muuta haluaisitte ohjelmistorobotiikasta sanoa?