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From supply to production:
Optimization and harmonization of routine materials

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Laura Dufva

1st supervisor: Anni-Kaisa Kähkönen
2nd supervisor: Sirpa Multaharju

ABSTRACT

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This thesis focuses to investigate routine material purchasing and its importance for the case company. The aim is to find the effective way to manage routine material flows from purchase to production. The most important strategic aspects are identified from the previous literature and these form the theoretical part of the thesis. General sourcing processes and Kraljic's matrix build the basis for the study and the analysis is complemented with ABC-analysis, inventory management, just-in-time principles, transaction cost and supply base reduction.

The research is conducted as a qualitative case study. The collected data consists of four interviews, which were conducted with semi-structured interview format. The group of interviews consists from the case company's employees, working in production. In addition to this, in this thesis is utilized analysation of tender results and data from company's ERP-system. The results showed that the importance of routine materials can be surprisingly high from the production's point of view. The current working methods for purchasing these materials were seen as too inefficient, and therefore different suggestions are proposed for the case company to improve strategies for acquiring these routine materials.

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Tämän tutkimuksen tavoitteena on tutkia rutiinimateriaalien hankintaa ja sen tärkeyttä kohdeyritykselle. Työn tavoitteena on löytää tehokkaampia ratkaisuja siihen, kuinka materiaalivirtojen johtaminen tulisi järjestellä aina hankinnasta, varaston kautta tuotantoon. Työn teoreettisen osan muodostavat aikaisemmasta kirjallisuudesta löydetyt strategiset suuntaukset, jotka vaikuttavat työn lopputulokseen. Tyypilliset hankintaprosessit ja Kraljicin matriisi muodostavat tutkimukselle pohjan, jota täydentävät ABC-analyysi, varastonhallinta menetelmät, just-in-time -periaatteet, transaktiokustannukset ja toimittajakentän pienentäminen.

Tutkimus on suoritettu laadullisena tapaustutkimuksena. Analysoitava materiaali koostuu neljästä haastattelusta, jotka toteutettiin puoli-strukturoidulla menetelmällä. Haastateltavien joukko koostuu kohdeyrityksen tuotannon työntekijöistä. Haastattelumateriaalin lisäksi työssä on hyödynnetty tuloksia pidetyistä kilpailutuksista sekä EPR-järjestelmästä kerätyistä tiedoista. Tutkimustulosten mukaan tuotannon näkökulmasta katsottuna rutiinimateriaalien merkitys yrityksen tuotannolle on suuri. Nykyiset johtamistavat rutiinimateriaalien kanssa nähdään liian tehottomina ja analyysien pohjalta kohdeyritykselle on muodostettu ehdotuksia siitä, kuinka he voisivat tehostaa strategioitaan rutiinimateriaalien osalta.

ACKNOWLEDGEMENTS

I started my studies five years ago in Lappeenranta. During this path I have met lovely people and learned from business but also a lot from myself. These five years have been amazing and I am so thankful for the LUT University for the capabilities and knowledge I have gained during these years. Finally, I started to write my Thesis in this February. The writing process has been full of work and long days, and week-ends. Thanks to my supervisor Anni-Kaisa who has gave advises during this writing process.

It feels strange that the path of studying has come to an end but at the same time I feel curious about what the future can offer. Thanks to my family and friends for supporting me during this writing process but also for encouraging me during these all years. Special thanks to my boyfriend, who has been beside me when I have needed it most. It is time for the new adventures!

In Porvoo, May 26th 2019
Laura Dufva

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1. INTRODUCTION

Sourcing and sourcing activities have increased their importance in business world. There might not be any company who does not have to buy something to carry out their business. That is why sourcing is an important topic to research. The overall role of sourcing organization in companies has changed during last decades, and it has become a strategic function, and at the same time, it is realized that by sourcing it is possible to reach copetitive advantage (Chan & Chin, 2007). The new role of sourcing has changed management ways in companies.

According to Petersen, Handfield and Ragatz (2005), the itegration of purchasing into company's strategic planning is a one way to reach more benefits and competitive advantage on markets. Quality assurance, material inventory and performance of productivity can be enhanced through right sourcing decisions (Bianchini, Benci, Pellegrini & Rossi, 2019). Tendering and optimization of purchased materials is beneficial if company is trying to find new materials to replace the old ones or if there has emerged a need to reduce supplier base. Selection of suppliers is overall seen as one of the major key factors of effecting on optimized supply chain (Bianchini et al. 2019). Just-in-time thinking is the way to optimize the purchased materials, as the material flows are planned to be delivered in the right time and with right quantities.

Kraljic's matrix (Kraljic, 1983) is one of the most common purchasing portfolio models. The strategic materials that the company is purchasing are usually seen as the most important ones and are investigated most often. In this thesis the best ways to carry out a sourcing process for routine or non-critical products are described. According to the Kraljic's matrix, these products are situated to the left down corner. In this matrix the non-critical or routine products are not seen as important as for example startegic products because of wide range of availability and because of their low impact on profotability (Kraljic, 1983). It can be easily forgotten that these products can have a huge effect on company's production despite their low value or non-complexity of supply. In this thesis the strategic sourcing process for non-critical materials is studied. Non-critical products can be most likely purchased from

several suppliers, when the supplier base can increase easily. The challenge is that materials which are purchased from different sources might have different characteristics. That is the issue which can affect on production efficiency imperceptibly.

The routine products might be important for companies' production, even though the purchasing value or share from overall purchasing value is low. This study presents the reasons why it can be benefical to take a deeper look into this product category. Simplification is mentioned to be one of the suitable strategies for routine products. Simplification and harmonization require working power from sourcing. By tendering and optimization it is possible to make material flows more efficient. Accroding to Nicoletti (2018) companies have to pay attention to process optimization because productivity is growing its importance in competitive business world. Agile procurement can be the answer to these problems and sourcing function should focus more on what and how to buy different materials, when also reduction of purchasing prices is possible (Nicoletti, 2018). While concentrating on agile sourcing processes it is possible to optimize whole sourcing processes, in this case with routine sourced products.

This study presents the best practices on how to conduct a sourcing project for the non-critical or routine product category. The aim is that the case company could find more effective ways to source these materials. The aim of this study is to simplify the current supplier base for these materials and to find more effective ways of working with selected suppliers. Actually, there are not available a lot of empirical studies about advantages of supplier base reduction, and sourcing only from a few suppliers (Odgen, 2006). Also Sánchez-Rodríguez et al. (2006) have stated that there is only a few academic studies, which have investigated the results of purchasing process standardization and its benefits for business efficiency. They have investigated this issue, and based on their study, the standardization of materials and procedures in purchasing can help companies to increase their quality of materials, delivery accuracy from suppliers and performance of inventory (Sánchez-Rodríguez et al. 2006).

1.1 Research questions and objectives

The aim of this study is to investigate how the product and supplier base for sourced non-critical or routine materials can be harmonized and optimized. This study will help case company to develop more efficient ways on how to purchase routine materials and how to optimize the inventory management based on just-in-time principles. The optimization of purchased materials will include many different perspectives. There is identified a need for supplier base reduction, simplification of product range and possible savings. The study will investigate how the sourcing process steps can help while trying to optimize the base of supply. Even though the value of purchases of this category is often quite low, when comparing to the whole value of purchases, these materials may have strategic importance for some functions. In general, it is recommended to use following tactics for non-critical products: volume optimization for orders, transaction costs reduction by utilizing product standardization, processing material flows efficient way and optimization of material inventory (Hesping & Schiele, 2015). Based on these tactics is formed the main research question:

> ***RQ1: How material flow from supply to production of routine materials can be optimized and harmonized?***

The optimization and harmonization of routine materials require guidelines on how it could be cnducted in the most efficient way. The typical sourcing process steps will be indentified in the theoretical part of the study. In the empirical part the follow up of the suggested steps are investigated. The sub-research question one is trying to find the answer on what are the process steps in sourcing process.

Purchasing portfolio models have gained criticism, as all of the purchased products cannot be categorized or managed according to the certain ways (Gerderman & Van Weele, 2002). Even though Kraljic's matrix has a clear guideline for purchasing professionals, it has been argued that how different companies can categorize their product just according to two different dimensions, presented in Kraljic's matrix. This study presents the reasons why also routine or non-critical materials might have a

huge impact, for example for the company's production, and what kind of benefits also sourcing might get by reviewing this. From this point of view the second sub-research question is formed. The aim is to find the answer on how the case company should organize the sourcing of routine materials.

According to Moore, Baldwin, Camm and Cook (2002), transaction costs should be minimized for routine materials by standardizing the materials in that category, then automated transactions would be needed. Some researchers recommend to use arms-length relationships and simple sources with routine materials (Drake, Lee & Hussain, 2013). In the Moore's et al. (2002) and Drake's et al. (2013) statements is discrepancy as simplification and reduction of transactions of routine materials requires supplier base reductions, but Drake et al (2013) recommend to use arm length relationships with routine materials. Because of this kind of disharmony, in this study is taken into account also the transactional costs. The reduction of suppliers' amount can help to reduce transactional costs and release buyers' time to other activities. Because of the warehouse size in the case company, purchasing of non-critical product must be just in time. This will help in inventory management and optimization of purchasing. The sub-research question three is trying to find the answer on question, what kind of strategic issues should take into account during sourcing process. This study will give a new insight for a sourcing strategies. The aim of this thesis is to find the suggestions for the case company, how they can harmonize and optimize this product category. The sub-research questions will give answer on above problems.

SQ 1: What are the steps of typical sourcing process and how these should be followed in routine product purchasing?

SQ 2: What is the significance of routine materials for company's production?

SQ 3: What strategic issues may have an effect on sourcing decisions and how the case company should consider these during the decision making?

These sub-research questions will help in finding the answer to the main research question. These sub-research questions collect the main issues which can have strategic importance during the sourcing decision making process. By this the researcher is trying to collect a broad overview for the case company, and therefore it is possible to evaluate the different suggestions from many perspectives. Finally based on that, they should be able to have the best solution to manage the product category.

1.2 Theoretical framework

The aim of this study is to find out the best suggestions for the case company on how they can harmonize and optimize their routine material purchasing. The study follows the typical steps of sourcing process. The aim of this study is to find out the best practices to carry out effective sourcing process. In the theoretical part of this study an insight into the sourcing and strategic topics is given. Two most common product categorizations are used in a categorization phase to help to identify all the products in the scope. This and other models have gained criticism as real business world is much more complex than this categorizing shows (Gerderman & Van Weele, 2002). The suitable sourcing strategies for each categorization group are established in the theoretical part.

The established strategic sourcing process is following the steps, which have been adopted, from previous literature. In this thesis the pre-order process, adopted from Scott et al. (2011) is used. The steps of this process are identification of need, specification phase, actual sourcing, tendering, negotiations, supplier selection and finally contract undersigning. The strategic sourcing process are identified in the theoretical part and some remarks are done in the empirical part on how this was utilized the real business case.

The theoretical framework for this study is formed based on previous studies and is presented in figure 1. Many previous studies showed that despite of non-importance of this material category, efficient order processing and reduction of transaction may be suitable strategies to carry out with routine or non-critical materials (Caniëls, &

Gelderman, 2005). Product categorization is raised as a big topic in this thesis. According to Trautmann, Bals and Hartmann (2009), product categorization models can work as frameworks for purchasers on how they can manage their sourcing activities in a sufficient ways.

In this study the main topics that have an effect on sourcing decisions are highlighted. These issues are supplier base reduction, Just-in-time principles, inventory management and transaction costs. These topics are explained more deeply in the theoretical part. By taken into account these strategic issues, it is possible to get a broader picture of activities and strategies related to sourcing. George (2002) has highlighted that lean or just-in-time strategies can help companies to eliminate the costs which are caused by complex activities. The theoretical framework of this study is presented in figure 1.

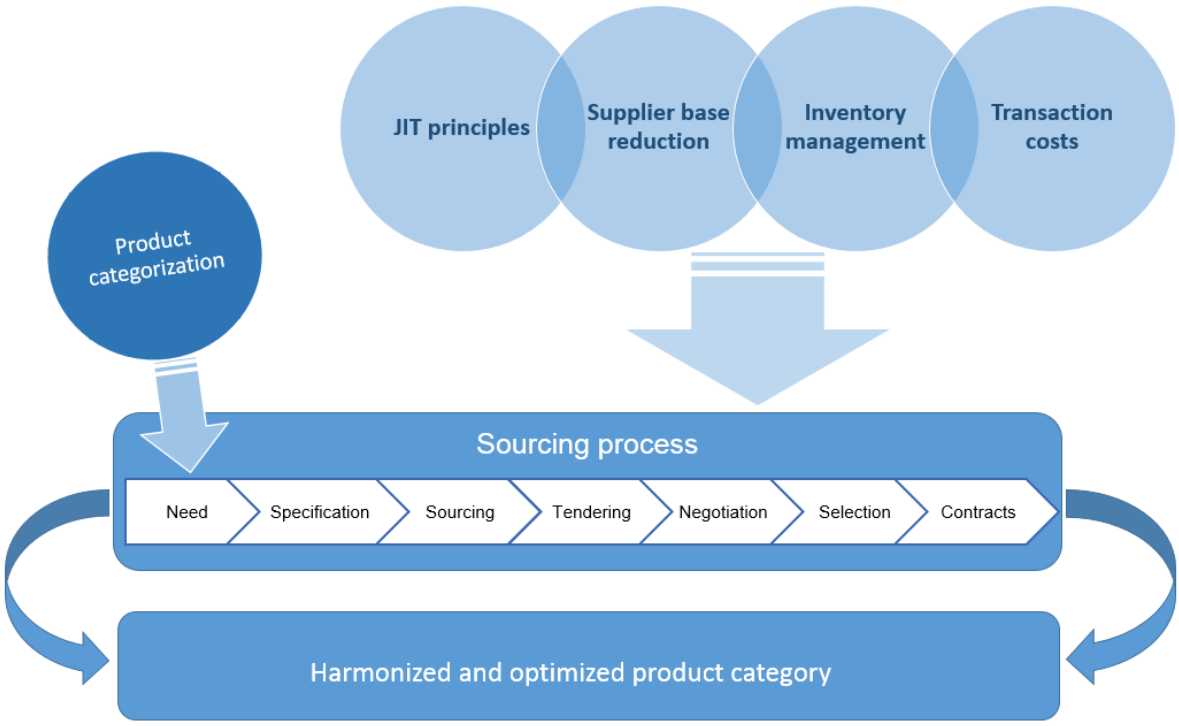


Figure 1. Theoretical framework of the study.

This thesis is concentrated to find the ways to optimize purchases by following typical sourcing process and taking into account the company's internal stakeholder's requirements and needs. Just-in-time principles in purchasing are followed so the optimization can reach most efficient solutions through tenders and analysation. The aim is to harmonize the current sourcing strategy and possibly reduce the supplier base, while also inventory management is included in the decision making.

1.3 Definitions

In this chapter is defined the most important terms, which are related to the investigated topic. These terms are closely related to the research questions and that is why those are good to be clarified separately. By this clarification, reader has a better understanding of examined issues, but later on, in theoretical part of this study, these topics are discussed more deeply.

Purchasing

Van Weele (2014) has concluded the purchasing in a one sentence: "Purchasing is the management of the company's external resources in such a way that the supply of all goods, services, capabilities and knowledge which are necessary for running, maintaining and managing the company's primary and support activities is secures at the most favourable conditions". According to Benton Jr. (2010), purchasing includes the acts when materials are delivered in the right quality, right quantity, at the market price and in right delivery date. Purchasing is defined to be the analyzation of purchasing spend, identification of possible suppliers and developing the relationships with suitable suppliers. Overall, the main task is to secure the efficient material processing from the suppliers, at the right quality and quantity. (Van Weele, 2014)

Sourcing

Sourcing includes the activities to find, select, contract and manage the possible sources of supply. The aim of sourcing is to find the best suppleir strategy for a certain product category. (Van Weele, 2014) The main activity for sourcing is to research and determine qaulified sources of needed materials and equipments from the amrkets (Benton Jr., 2010). Sourcing is an integrated function in purchasing and

supply management which coordinates the requirements of internal customers to the supply base (Moser, 2007).

Non-critical/routine products

These materials are categorized as non-critical on Kraljic's matrix (1983). The supply risk and profit impact are low for these materials (Kraljic, 1983). Non-critical products are typically easy to find from markets, there are many suppliers available (Montgomery, Ogden & Boehmke, 2018).

C-category materials

C-materials are the material category group in ABC-categozation (Dhoka & Choudary, 2013). C-category consists of materials which item amount is around 70-80 % of the total purchased amount and the value of sourcing is around 10-20 % from the annual value (Leenders, Fearon, Flynn & Johnson, 2001).

Tendering

By tendering the purchasing department may ask for bids from different suppliers. Tender can be formal or informal, open or closed. The tender which is open does not have any pre-qualifications of different suppliers. A closed tender is dedicated for suppleirs who are preselected carefully. (Van Weele, 2014)

Just-in-time

Originally JIT developed by Taiichi Ohno, a vice-president of Japanese Toyota motor company, in the 1960s (Lysons & Farrington, 2016). This is system, where all the materials which are purchased, are delivered, processed and trasported just in right time. The main goal is to reduce waste and cycle times. By the end all of the inventory levels are minimized. (Benton Jr., 2010)

1.4 Limitations

This study is focused on non-critical or routine materials. Strategic materials or other materials in Kralic's matrix are not in the scope. The aim of this study is to investigate the reasons why it might be also beneficial to conduct a sourcing project for the

routine materials. This leads in to the overcome that other purchasing categories are not under the investigation. The materials which are in the scope are defined by the Case Company and by the previous analysation. These materials have several supplier options and do not perceive any critical characteristics so therefore these are defined as standardized products.

The interviews were held only for the case company's production employees and not for the warehouse or other functions employees. The aim of the study is to investigate the production employees' opinions and insights against the routine materials. Can be assumed that the production workers have the best picture of the functionality of routine materials as they are using these materials in the production daily. The group of interviewees is delimited to the production function.

1.5 Research methodology

This study is conducted as a qualitative research. According to Eskola and Suoranta (1998), in the qualitative study, researcher should concentrate on small amount of interviews but analyse those deeply. The qualitative research does not have a hypothesis that is settled before hand, as a quantitative research has. This means that in the qualitative research the researcher does not have any assumptions for investigated topic. In the qualitative research the aim is not to make statistical generalization, rather the aim is to describe certain cases and understood those more deeply. (Eskola & Suroanta, 1998)

The research strategy of this study is a single case study. According to Laine, Bamberg and Jokinen (2015), the case study is effective to use, when it is aimed to collect wide range of different dimensions from studied issue. In this study the qualitative data and the quantitative data are combined to get a broader view of examined topic. The case study allows researcher to use more in-depth evaluation and to observe formal and informal processes (Kotula, Ho, Dey, & Lee, 2015).

The data is collected by interviews for the case company's employees and by tendering from different suppliers. Also some of the data is gathered from the case

company's ERP-system. To make the results of the study trustworthy and comprehensive, the sampling should be done precisely and the interviewees should be selected carefully (Eskola & Suoranta, 1998). The sampling consist of company's internal stakeholders who are using the materials, which are in the scope of this study, in production. By these interviews researcher try to find out the importance of routine materials for company's production.

The interviews were held for case company's employees from production, as face-to-face interviews. The form was semi-structured interview. The order of interview questions was the same for each interviewee, and the interviewees were allowed to answer in their own words (Eskola & Suroanta, 1998). This gives broader possibilities to interviewees to explain their own opinions and feelings. The aim of interview is typically to explore what interviewee thinks about investigated topic and what are the interviewees' own opinions (Eskola & Suoranta, 1998).

The data is mainly in qualitative format but also some numeric data is analysed. The numeric data not presented in this study because the data is confidential. It is used as a help to identify the background and current situation and in the suggestions for the case company. With these methods researcher have a broad view of investigated topic and it is possible to find the suggestions for best practices to handle these materials in the future.

1.6 Structure of the thesis

This study starts by introduction, which includes the background of the needs, why this kind of investigation and project is conducted. Theoretical framework is formed from the theoretical part of this study. Theoretical framework act as a guideline and tells what theoretical part includes and how these issues are effecting on this study. After the theoretical framework the most important terms related to study are defined. The last part of introduction of the study are limitations.

This thesis is included two main parts: theoretical and empirical part. The second chapter investigates the theory of examined topic. In this section the previous literature and theoretical perspectives are presented. This part is mostly based on theoretical framework which was presented in introduction chapter. Examined topics are explained here more precisely. This part starts with the introduction of sourcing process. After the main steps of sourcing process, there are explained some other important issues, which have effect on sourcing decisions and should be taken into account while conducting the sourcing process. First are introduced the most common purchasing categorization tools, Kraljic's matrix and ABC-categorization. After these is introduced inventory management and its importance for sourcing decision and last but not least is a part about supplier base reduction and its benefits but risks also.

The third chapter is the empirical part of the thesis. First is presented the research methodology with data collection methods. The background of the study starts the chapter of empirical findings. After methodology and background the analysation of interviews and tender results are introduced. Based on these are formed the suggestions to how the case company can harmonize and optimize the routine product category. This part includes discussion between earlier literature and test results. In last part is gathered together the theory and empirical results of the whole study. It includes conclusions and further discussion about research topic. The last part gives an overall insight of the investigated issue and compares the earlier studies and the results of this thesis.

2. CATEGORIZATION AND INVENTORY MANAGEMENT IN SOURCING

Scott, Lundgren and Thompson (2011) have divided sourcing into two business activities, first one is the process of selecting new suppliers and second main activity is the management of supplier relationships. The operational parts of the sourcing activities are described to be acquisition request, tenders, negotiation, supplier selection and the allocation of the orders (Nicoletti, 2018). Performing of these tasks requires the observation of available stocks (Nicoletti, 2018).

According to Monczka, Handifield, Giunipero and Patterson (2008), different sourcing strategies can variate a lot based on different purchasing categories. The sourced materials can be divided into different categories (Monzcka et al. 2008). Sourcing and supply management have increased their importance in companies' value creation (Olsen & Ellram, 1997). For sourcing there are available many different approaches on how the companies can exploit different optimization opportunities with their sourcing activities (Olsen & Ellram, 1997). By linking company's supply chain strategy into company's sourcing activities, companies can reach competitive advantage (Apte, Rendon & Salmeron, 2011).

Overall, sourcing activities may variate a lot depending on sourced materials or on strategy of the company. Many different studies have been done about how different sourcing strategies could help in a certain industry, but studies which examines the strategic sourcing activities for non-critical material, cannot be found. The careful selection of sourcing strategy is seen as important issue in sourcing (Zhu, 2015). By that the purchasing company can try to protect itself from supply disruptions (Zhu, 2015).

Sourcing activities have more effect on the total supply chain decisions because the role of the sourcing has changed to be more like strategic partner (Apte et al. 2010). By careful planning, the sourcing can reach many benefits and improve overall efficiency in the company (Scott et al. 2011). These benefits are for example improved quality, reduced cycle times, cash flow improvement, cost improvement, improved service for end customers and cost reductions (Scott et al. 2011). The most efficient

results can be reached if the sourcing activities are included into the supply chain strategy (Apte et al. 2010).

Purchasing is balancing between value, risks and costs. Overall, the purchasing cost reductions can be achieved through supplier base reduction, product standardization, global sourcing, outsourcing, by electronic auctions or with contract management. For many decades, the cost reductions has been the main agenda for purchasing, but recently the risk management and value improvement have raised their importance. Value can be improved by early supplier involvement or by revenue growth through new products. Risk management is balancing between single or multiple sourcing, sustainable purchasing, supplier auditing or supplier quality assurance. (Van Weele, 2014)

2.1 Sourcing processes

In this section the common sourcing process model from van Weele and pre-order process from Sott et al. are introduced. Van Weele (2014) has divided sourcing into different stages. Van Weele's (2014) process description is stated as purchasing process model, which illustrates the main activities in purchasing, sourcing and procurement (van Weele, 2014). With this process model the different activities for procurement, sourcing, purchasing and buying can be defined (van Weele, 2014). Generally these terms can be used as synonyms but van Weele's model clarifies the differences between those. In Figure 2 is presented van Weele's purchasing process model.

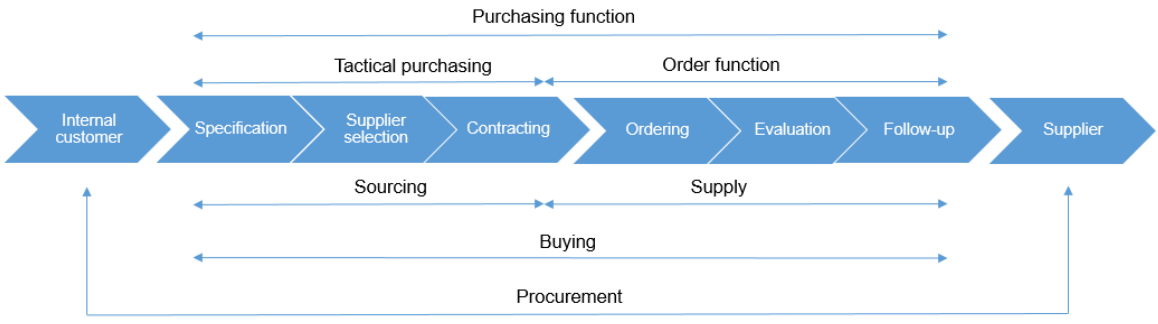


Figure 2. Van Weele's (2014) purchasing process model.

From the figure 2 can be seen that procurement includes the whole path from the internal customer's needs to the supplier contact. Sourcing includes the strategic work related to the specification, supplier selection and contracting. Supply covers up the ordering, vendor evaluation and follow-up of vendor actions. Purchasing function is the organization that is responsible of sourcing and supply. Sourcing can be defined as tactical purchasing and supply can be defined as the ordering function of purchasing. Carr and Pearson (2002) have introduced the term strategic purchasing that includes the tasks related to process planning, evaluating, implementing and controlling. Van Weele's (2014) purchasing process model gives an overview to the total sourcing, purchasing and procurement tasks and helps to identify each function and process steps. According to Sánchez-Rodríguez et al. (2006), by the follow up of standard sourcing process steps the possibility of errors in purchasing process can be reduced. Carr and Pearson (2002) have identified that strategic purchasing can effect positively on organizations performance.

Monzca, Handfield, Giunipero and Patterson (2008) have identified sourcing process as purchase to pay process. The order of process steps can variate based on the company characteristics and based on the purchased items (Scott et al. 2011). Different companies have different kind of sourcing processes. Generally, the sourcing process includes following steps: specification, selection, contracting, ordering, expediting and evaluating (van Weele, 2005). These steps are identified in the figure 2 and in the previous paragraph. The sourcing activities from the inner stakeholders' need to the supplier evaluation are identified in that process. Scott, Lundgren and Thompson (2011) have divided sourcing processes into the pre-order steps and post-order steps. The pre-order steps are used as a guideline in this optimization and harmonization process, this process is presented in the figure 3. From this picture can be seen that the process steps are quite similar as in the van Weele's (2014) purchasing process model. Compared to the van Weele's model, in the pre-order process the sourcing related steps are expanded and explained more deeply.

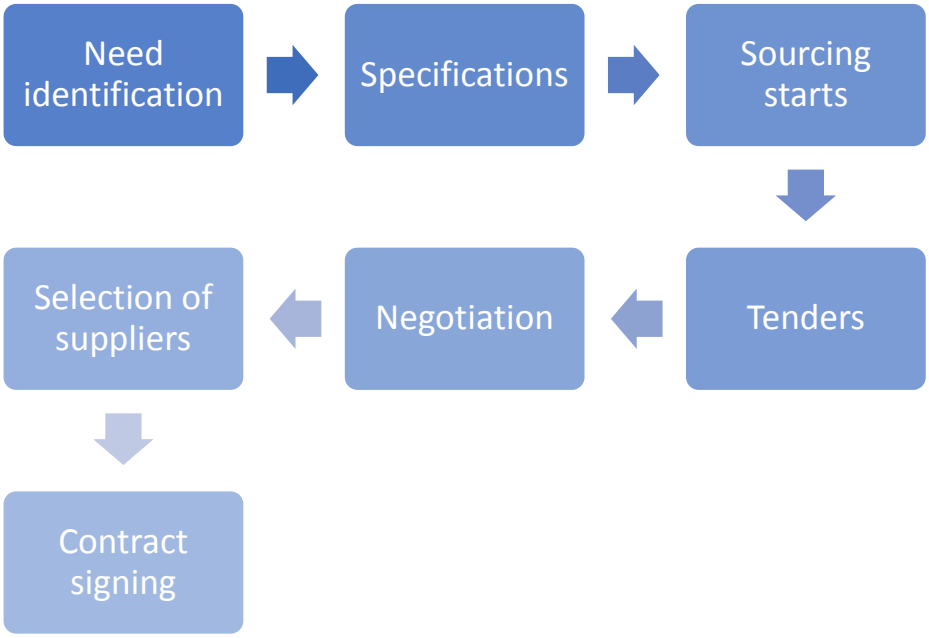


Figure 3. Pre-order process by Scott et al. (2011).

The whole process starts from the need identification. After this the specifications are defined. In this phase the level of needed service, lead-times, costs and quality for the product and delivery are identified. After this sourcing organization starts the identification of possible suppliers. Based on previous analyzation, the tenders for suppliers who are identified as possible ones are released. Negotiations are started in the next phase. Then purchasers and suppliers negotiate about the deeper specifications of the business case. Purchasers will make the decisions and selection based on these negotiations, which is the sixth step. Last step is naturally the undersigning of the contract, usually buying company prepares the contract based on their agreement or instructions. (Scott et al. 2011) After this the sourcing pre-process is carried out and it follows the post-order process. Next these process steps are explained more deeply.

2.1.1 Need identification and Specification of purchased items

The whole process starts with need identification (Scott et al. 2011). Generally, it is recommended to gather the data from internal stakeholders to secure the accurate requirements and clarified baseline for the whole process (Zeng, 2003). The need is the trigger for the start of the sourcing process. Without a need, the process is not

going to start. Both need identification and specification of purchased items are strongly related to company's internal stakeholder's requirements. By conducting the sourcing process, sourcing department is trying to find the solutions on internal stakeholder's needs.

On a specification phase the material specifications and need should be identified. The specifications should include following issues: quality specifications, the logistics specifications, legal and environmental specifications and a possible target budget. In quality specifications, the technical norms and standards for the purchased material should be included. On logistics specifications are identified the order batch sizes, expected delivery times and what kind of physical conditions the buyer is waiting for. On legal and environmental requirements the buying company can state their requirements for compliance of health, safety and environmental legislation. (van Weele, 2014) It is obvious that without product specifications it is difficult to ask suppliers to offer anything. With clear information statement, buying company gets the right price for the products they asking for. Unclear statement in the specifications can lead the suppliers to offer wrong prices when the final price might be something different than first offered. With specifications, both parties know what kind of materials are asked for.

2.1.2 Identification of possible suppliers

When sourcing department has identified the material specifications and the overall need is identified, the identification of suppliers should be started. Sometimes the current suppliers with whom buyers have existing contracts can fill up the sourcing need but sometimes a new supplier, who is not yet qualified in the supply base, can fill the need (Handfield et al. 2009). New suppliers can be found from the Internet. It should be remembered that the information, which is gathered from the internet and from the suppliers' website, might not be very precise (Iloranta & Pajunen-Muhonen, 2015). In addition to the Internet, suitable suppliers can be found from company's supplier database listings, professional magazines or from the professional exhibitions or from the fairs (Lysons & Farrington, 2016; Iloranta & Pajunen-Muhonen, 2015).

If new suppliers are found company should gain more information about them. It can be done by contacting directly to the supplier. First should be checked does the supplier have the requested products or materials available and is the supplier interested to continue negotiations or tendering process. (Iloranta & Pajunen-Muhonen, 2015) After these procedures, the buyer can decide whether it is interested to continue with supplier candidates.

2.1.3 Key features of tendering

With tenders it is possible to get a market overlook, by asking bids from different suppliers (van Weele, 2014). During this phase, the suppliers are invited to give their bids, for example through electronic system. The enquiry must include all necessary information about enquired materials (Weigel & Ruecker, 2015). The amount of clarification requests can be decreased by precisely done enquiry (Weigel & Ruecker, 2015). Buyer can utilize electronic systems in tendering phase. With request for proposal (RFP) the buyer can get the awareness about suppliers' competitiveness, for example the price range on the markets (van Weele, 2014). Request for quotations (RFQs) are used as a tools to request for bids from suppliers (Handfield et al. 2009). The difference between those two is that by RFP the vendors are first identified by giving them the material specifications so that do they have a possibility to offer certain products, and in RFQ the materials are requested with exact quantities and the specifications are even more exact (Benton Jr., 2010).

With tendering the aim is to establish the market situation, identify the new suppliers or make suppliers comparable and also get a price pressure towards up-coming negotiations (Weigel & Ruecker, 2015). The questionnaire for suppliers can be held if following conditions are met: the volume of purchased materials is high enough, buyer knows clearly the specifications of purchased materials, there are enough qualified suppliers on the markets, there is time to evaluate the results of tenders and the buyer do not have a preferred supplier yet for the materials requested (Handfield et al. 2009). Tender should include at least the following information: exact requested amounts for materials and possible individual scale amounts, precise

and specified descriptions of the demand, the dated of delivery, the deadline for the submission of answers to the tender and finally all the general term and conditions which are related to the purchase of enquired materials. (Weigel & Ruecker, 2015).

2.1.4 Negotiation principles

After the tender results are received, the buyer and possible suppliers can start the negotiations. Negotiations are defined as the process when purchaser and supplier try to reach a common agreement about the terms and conditions related to the purchased item (Benton Jr., 2010; Semuel et al. 2018). For example, Alafi (2014) have stated that pre-settled negotiation strategy can help buyers to reach their goals and final agreement with suppliers. Mutual dependencies and power between parties and the willingness to reach the final agreement are the prerequisites for a negotiation. If not all these prerequisites are fulfilled, then the other party is forced to accept other's suggestions or the negotiations end up. (Weigel & Ruecker, 2015) Negotiation can defined as an activity, when other party is trying to effect on other party's thoughts about negotiated issue. The aim is to change other party's opinion to match into the own opinions so that the solution will be mutual understanding. (Chebet, Rotich & Kurgat, 2015).

The target for purchaser is to reach the most optimal result for their company. The negotiation results have direct effect on company's business success. If the result is not good for the buying company, it can have effect on company's profit and loss account. It has been identified that negotiations are one of the most important tasks in the strategic sourcing. Generally, the negotiations include the discussion about following issues: prevention of price increases, possible price reductions, bundling of volumes, reallocation of framework agreements or about the acceptance of the offer from supplier. (Weigel & Ruecker, 2015)

2.1.5 Supplier selection

Supplier selection is seen as a process step which includes the necessary activities to select a proper and suitable supplier for a specific material, products or services in a way that buying company may gain some competitive advantages through supplier's capabilities and offerings (Moore, 2007). The best offer is chosen based on the tender evaluation, which includes the comparison of selected criteria (Weigel & Ruecker, 2015). According to Asadabadi (2017), the selection of right supplier could really effect on company's overall performance. The deep evaluation of tenders leads into the better solutions and future orders are placed according to the objectives (Weigel & Ruecker, 2015).

Supplier selection has a significant role in the supply chain management; furthermore, it has received more attention during last years from the practitioners and academics (Cristea & Cristea 2017). Companies' competitiveness could be enhanced with the right supplier selection (Cristea & Cristea 2017). Many academics have stated that supplier selection criteria varies by industry, by buying situations and by product categories (Sen et al. 2008). Fallahpour, Olugu, Musa, Wong and Noori (2017) have stated that quality, price or cost, delivery, manufacturing capability, management, service, research and development, technology, finance, reputation, relationship, flexibility, risk and safety and environmental aspect are the most common supplier criteria. In the table 1 supplier selection criteria from different practitioners is presented.

Table 1. Supplier selection criteria based on previous literature.

Sen et al. (2008)	Fallahpour et al. (2017)	Luzon & El-Sayegh (2016)	Choi & Hartley (1996)
• Cost • Quality • Service • Reliability • Management • Organization and Technology	• Quality • Price or cost • Delivery • Manufacturing Capability • Management • Service • R&D • Technology • Finance • Reputation • Relationship • Flexibility • Risk and Safety • Environment	• Performance • Technical capability • Geographical location • Financial position • Production facility • Quality • Price • Delivery • Warranties • Service	• Finance • Consistency • Relationships • Flexibility • Technological capability • Customer service • Reliability • Price

This table illustrates the main qualified criteria in supplier selection. Choi's and Hartley's list is over twenty years older than Sen et al.'s, Fallahpour et al.'s and Luzon's and El-Sayegh's listings which indicates that during the last decades the main supplier selection criteria have not changed a lot. Some new aspects which should be considered during supplier selection are added. All practitioners have raised up the price, quality, service capabilities, management and supplier's technological capabilities as important supplier selection criteria. In the latest research, the environmental issues as important criteria are raised up.

2.1.6 Contract details

After the negotiations are finished and suppliers are selected it is time to make a contract. Purchasing contract can be defined as lawfully effective, formal and written agreement which is signed by both parties, involved in exchange of material or service, and where is defined their rights, obligations and duties (Wen, Jiaqing & Hanbin, 2011). It is important to notice that there will be different issues to take into account while contracting about services or materials. With materials the contract

should include price, which includes for example possible quantity scale discounts (Weigel & Ruecker, 2015). Price can be agreed as fixed, when any changes during a contract validity are done, or as cost based contract, when the price can be changed during a contract validity based on agreement (Wen et al. 2011). The payment and delivery conditions should be agreed, also should be agreed about the stock issues, whether the supplier keeps the materials in their stock ready for shipments, delivery times and deliveries from supplier to purchaser.

Contract should cover the agreement about how to proceed with returns, rejections or replacements, which are follow-up costs. It is recommended to agree about the terms and conditions of purchases. Quality is very important matter and that is why the quality assurance agreement should be signed. (Weigel & Ruecker, 2015) Overall, purchasing contract should include all the details, which have effect on the path of the purchased material supply. Wen et al. (2011) have identified the typical content of the purchasing contract. First should be established the initiative part with introduction, name of the parties, place and time of signing contract and contract title. The second part of contract should include body text with material title and specifications of material, quality requirement and agreements, quantity, packaging, price, transportation, delivery time and final location, payment terms, required inspection, insurance, breach and dispute resolving issues and force majure. In the last part should be included end portion with contract shares, dates and period of effectivity and signatures and seals. (Wen et al. 2011)

2.2 Product categorization in sourcing

It is typical for sourcing to categorize the sourced materials. In this chapter is presented the product categorization tools which are most commonly used in purchasing, Kraljic's purchasing portfolio model and ABC-analysis. Both of these can help purchasers to categorize the sourced materials and help to select suitable strategy for each product group. Spend-analysis, which means scanning of purchased materials, is the base for improvement of procurement (Iloranta & Pajunen-Muhonen, 2015). In spend analysis company can differentiate the material and cash flows and their relationships, but the most common issue in spend-analysis is to find out the

relative importance of different purchases for company (Iloranta & Pajunen-Muhonen, 2015).

It is stated that the purchasing portfolio models can support companies to analyse their expenses (Cox, 1997). Product segmentation and categorization can help purchasing departments to differentiate the ways of working with different material groups, allocate resources and use of time, target the capabilities and learning and split the tasks between different organizations (Iloranta & Pajunen-Muhonen, 2015). These models can work as frameworks for purchasers, how they can manage their supply strategies in a more effective way (Trautmann, Bals & Hartmann, 2009).

Purchasing portfolio models have gained criticism because most often, they need quantitative and qualitative inputs, and mostly this kind of data is not easily available from companies' information systems (Gelderman & Van Weele, 2003; Zolkiewski, & Turnbull, 2002). Overall, it is complex to position different products into a matrix (Gerderman & Van Weele, 2002). Problems in the utilization of different models are that the products are difficult to categorize or that the business is that complex that categorization into one certain group is impossible.

2.2.1 Purchasing portfolio model

Probably the most known purchasing and supply chain management portfolio model is Kraljic's matrix, which categorizes the purchased products based on to the importance of purchasing and based on the complexity of the supply market (Luzzini, Caniato, Ronchi, & Spina 2012). This matrix categorizes the products into four different categories; noncritical, bottleneck, leverage and strategic materials (Kraljic, 1983). These categorizations should help sourcing professionals to select suitable sourcing management activities (Luzzini et al. 2012). The simplified and general idea of Kraljic's purchasing portfolio model is to minimize the supply risk and get the most out of buying power (Gelderman & van Weele, 2005). Next is introduced the basis of product categorization with Kraljic's matrix and suitable strategies for each category, from previous literature.

In Kraljic's matrix the purchased products or services are divided according to the risk or complexity level of supply and importance of purchase (Caniëls & Gelderman, 2005). Supply risk or complexity of supply markets is external dimension, and importance of purchase brings the internal dimension into the review (Dubois & Pedersen, 2002). The easiest way to describe the importance of product group is to define the relative size of the purchased material group, that takes into account total costs, company's profitability, and benefit for customers (Iloranta & Pajunen-Muhonen, 2015).

According to Montgomery, Ogden, and Boehmke (2018), the general idea of purchasing portfolio model is to minimize the vulnerability of supply and at the same time maximize the purchasing power, by combining the internal needs of the purchasing company to external resources of different suppliers. The complexity of supply is on horizontal axis of the matrix (Kraljic, 1983). At the right side of the matrix are the products which have only a few different suppliers available in the markets (Gelderman & van Weele, 2005), even though some of the supplier might have the monopoly or oligopoly situation in the markets. (Iloranta & Pajunen-Muhonen, 2015). The annual value in euros is normally the biggest within materials in these product categories (Iloranta & Pajunen-Muhonen, 2015). At the left side are the products which have several different suppliers available (Gelderman & van Weele, 2005), and the markets can be described as purchasers markets, because of wide range of supplier options (Iloranta & Pajunen-Muhonen, 2015). The matrix (figure 4.) include four categories: leverage items, Strategic Items, Bottleneck items and non-critical items (Kraljic, 1983).

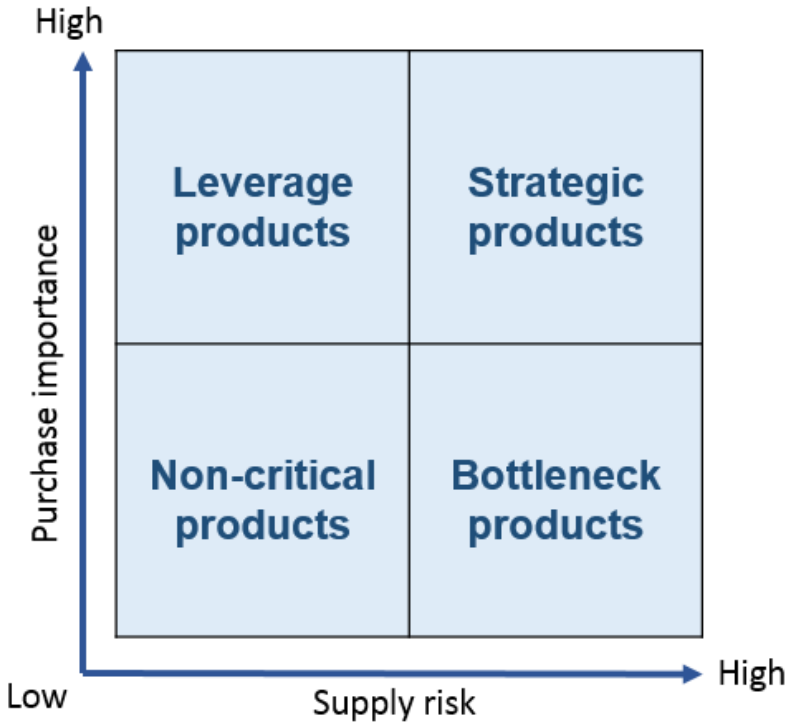


Figure 4. Kraljic's (1983) purchasing portfolio model.

Non-critical products are typically easily to find from markets, there are many suppliers available and materials have only a little financial impact (Montgomery, Ogden & Boehmke, 2018). Non-critical products are also called as routine products; these materials have usually only little technical or commercial problems if we consider this from the purchasing point of view (van Weele, 2018). According to Gelderman and van Weele (2005), routine products are often ordered only frequently, which means that transaction costs are usually high for this material group. This product category consist typically many different materials, which total value is not that high (Iloranta & Pajunen-Muhonen, 2015). Usually the delivery problems of non-critical products do not cause a big problems for a business (Scott et al. 2011), which relates well to the category name “non-critical products”. Typically the sourcing process by itself cause a lot more costs compared to the purchasing value of sourced materials (Iloranta & Pajunen-Muhonen, 2015).

The leverage product group allows buying companies to exploit their purchasing power (Gelderman & van Weele, 2005). The reason for this is that, for volume materials, there will be many different suppliers available and that is why there is a lot

of competition on the markets (Van Weele, 2018). The annual consumption and purchasing volume are very high for leverage materials, typically leverage products are also called as volume products (Iloranta & Pajunen-Muhonen, 2015). Leverage products are purchased in large volumes, then the unit cost have a lot of impact on total value (Montgomery et al. 2018). These materials represent standard quality grades (van Weele, 2018). The annual value in euros is normally the biggest within materials in this product category compared to other groups. (Iloranta, & Pajunen-Muhonen, 2015)

The total purchasing volume of bottleneck products is typically quite low (Iloranta & Pajunen-Muhonen, 2015). There might be expertized only a few suppliers for this category, the might exist only one supplier on the markets (Montgomery et al. 2018), which means that the supply risk is high for this product category (Gelderman & van Weele, 2005). Bottleneck products have usually unique characteristics (Scott et al. 2011), therefore these materials are difficult to substitute and their performance is not easy to measure (Montgomery, et al. 2018). Because of the uniqueness, bottleneck items can cause even production stops if out of stock situation occurs (Scott et al. 2011). Even though the value is low the out of stock situation may cause serious problems for company, and in this way, these materials can create the bottleneck for production or operation (Iloranta & Pajunen-Muhonen, 2015). Often the supplier is in the better position compared to purchasing company (van Weele, 2018). Bottleneck products might have high prices, bad service from supplier, long delivery times or other cost consequences (van Weele, 2018).

The strategic products have also unique characteristics and value adding features for purchasing company (Montgomery et al. 2018). Materials in this product category might have high-tech features, and are produced according to the customer's specification (van Weele, 2018). Strategic products are typically purchased in large volumes when the value of these materials is high, at the same time the importance of these materials is very critical for the buying company (Iloranta & Pajunen-Muhonen, 2015). The supply markets consist a high risk for this product category, and generally only a few suppliers are available (van Weele, 2018). Suppliers' expertize can create a critical consequences and because of that strategic materials cannot be

replaced (Montgomery et al. 2018). The purchasing company might become very dependent on the supplier which supplies the strategic materials for the company (Iloranta & Pajunen-Muhonen, 2015). The strategic products can be found from the right upper corner of the matrix (Gelderman & van Weele, 2005).

This categorization can be utilized while company is about to select a suitable sourcing strategy based on supply risk and purchase importance (Caniëls & Gelderman, 2005). Different practitioners have listed the strategies for each group, for example Gelderman and van Weele (2003) have modified the purchasing strategies for Kraljic's matrix. These different strategies and characteristics are introduced in the following phases and in the figure 5.

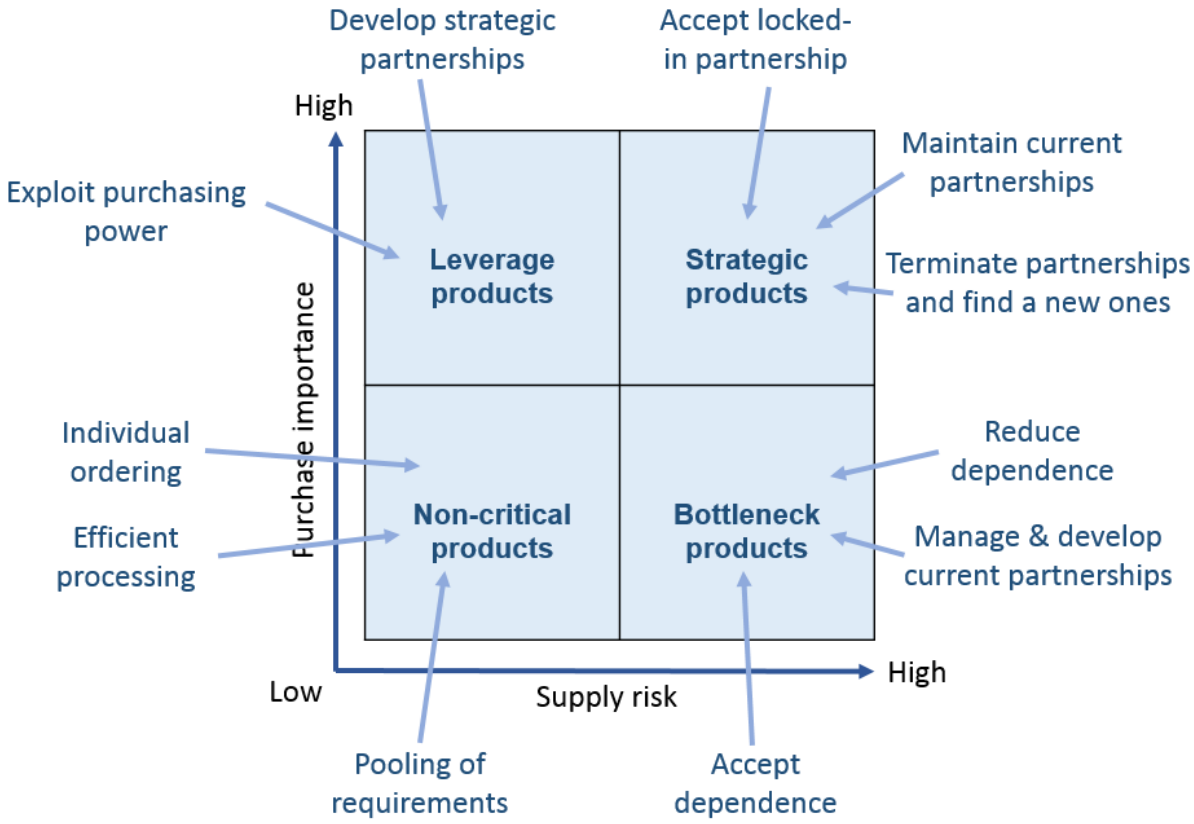


Figure 5. Recommended strategies for purchasing portfolio model.

As mentioned before the processing of non-critical product category creates normally more costs for company than what is the purchasing value of materials itself. Because of that the purchasing activities should be organized in the most efficient

way, so that the time of the purchasers is allocated for the more important products (van Weele, 2018). Based on this, for noncritical products it is suggested to use individual ordering and efficient processing (Caniëls & Gelderman, 2005). In individual ordering situation purchasers should try to reduce the ordering costs, which are related to buying, for example ordering, invoicing and buying processes (Gelderman & van Weele, 2003), this means that transaction costs should be reduced (Hesping & Schiele, 2016). Efficient processing can be reached by automatized ordering (Iloranta & Pajunen-Muhonen, 2015). A good way to ensure efficient processing is to change into a vendor-managed inventory (VMI), when supplier fills up the customers' shelves and ensures the material availability (Iloranta & Pajunen-Muhonen, 2015). Another suitable strategy for non-critical products is to pool the material requirements (Caniëls & Gelderman, 2005). By pooling the material requirements are combined with another materials and order quantities can be increased, this can be done by framework agreements, with VMI or by e-purchasing system. The aimof the pooling is to change the non-critical items into the leverage product category. (Gelderman & van Weele, 2003) For routine materials it is recommended to use two-bin system as inventory management tool, which is system that follows just-in-time principles (Miltenberg & Wijngaard, 1991), by this the inventory optimization is reached, which is recommended by Hesping and Schiele (2016).

With leverage products there is a lot of competition in the supply markets and it offers many different sourcing possibilities. With leverage products purchasers should try to exploit the buying power (Gelderman & van Weele, 2003). Full purchasing power can be reached by vendor selection, by targeted pricing negotiations, by product substitution or by order volume optimization (Hesping & Schiele, 2016). Competitive biddings are suitable for materials in this product category (Iloranta & Pajunen-Muhonen, 2015). For example, e-auctions can be efficient way to carry out tenders for this category, by this can be reached more competitive prices for products (van Weele, 2018). Overall, these activities might decrease the total costs and increase service level (Iloranta, & Pajunen-Muhonen, 2015). According to Caniëls and Gelderman (2005), with leverage products buying company should exploit the buying power and develop strategic partnerships with suppliers (Gelderman & van Weele, 2003). Because the value in euros is high in this products category, even

the small unit price decreases can decrease the annual costs radically. (Iloranta & Pajunen-Muhonen, 2015)

Sometimes, in the situation with bottleneck materials, purchasing company has to accept the dependence, and then the management actions should be targeted into contracting (Gelderman & van Weele, 2003). Purchaser should maintain the long-term relationship, emphasise the quality and keep high stock levels (Gelderman & van Weele, 2003), these actions help to secure the supply. In addition, suppliers should make backup plans for the materials in bottleneck group (Hesping & Schiele, 2016). Because of the importance for production (Scott et al. 2011), another recommended strategy for bottleneck items is to reduce the dependence towards particular supplier and reduce risk by finding new alternatives (Caniëls, & Gelderman, 2005). This can be reached by broadening the product specifications (Gelderman & van Weele, 2003), when alternative suppliers might become available. Another way is to source from new suppliers or to try to manage and develop current supplier relationships (Gelderman & van Weele, 2003), this especially requires the control of current suppliers (Hesping & Schiele, 2016). These activities should reduce the supply risk and the purchaser's dependence on a supplier. If company is able to reduce the supply risk, the products in bottleneck category are moved into the quadrant of non-critical materials. (Gelderman & van Weele, 2003)

The strategic products evolves the biggest challenges for purchasing companies, for example the typical tendering procedures are not suitable for this category because of the lack of alternative suppliers (Iloranta & Pajunen-Muhonen 2015). One suitable strategy for these products is to accept the locked-in partnership (Caniëls & Gelderman, 2005), then purchasers are typically in the situation where is not available another suppliers or the switching costs are too high (Gelderman & van Weele, 2003). Another suitable strategy is to maintain the current strategic partnerships (Caniëls & Gelderman, 2005), in that situation purchaser and supplier have mutual trust and then open information sharing between both parties is possible (Gelderman & van Weele, 2003). A tight supplier relationship is required to maintain the current cooperation, this might require more social skills from the purchasers and new ways of working from the whole organization (Iloranta & Pajunen-Muhonen,

2015). For example, electronic systems can help to improve cooperation between both parties (Iloranta & Pajunen-Muhonen, 2015). Another strategy could be to terminate the partnerships and to find the new suppliers (Caniëls & Gelderman, 2005), in this situation, the partnership may have developed to be as undesirable and supplier's performance may have been suffered (Gelderman & van Weele, 2003). Termination of current relationship starts the process to find a new suitable supplier (Gelderman & van Weele, 2003). Hesping and Schiele (2016) have stated that accurate demand forecasting, detailed market research, risk analysations, contingency planning and logistics, inventory and vendor control are required with strategic materials.

In the figure 5. is presented the recommended strategies visually. Before the company can utilize the suggested strategies or even evaluate what kind of strategy could be suitable for their situation, the sourced products have to be categorised. The complex issue is that many practitioners have criticized the purchasing portfolio model because sometimes the purchased products cannot be categorized or managed according to the certain ways (Gerderman & van Weele, 2002). This creates challenges for sourcing managers, because it can be difficult to categorise purchased materials in the first place. The aim of Kraljic's purchasing portfolio model is to act as a guideline, how to manage the product portfolio. Gelderman and van Weele (2005) have stated that the purchasing portfolio model can act as catalyst for a change in the purchasing department.

2.2.2 ABC-Analysis

Previously was highlighted that different methods to classify purchased items are available. One way is to use ABC analysis. In ABC-analysis the purchased items are categorized according to their annual purchasing value (Scholz-Reiter, Heger, Meinecke, Bergmann, 2012). This analysis is seen as microeconomic analytical method, which classifies the given quantities based on their quantity and value ratio (Weigel & Ruecker, 2015). Actually, ABC-analysis has been for a long time the only product categorization tool, before the Kraljic's matrix was developed (Gelderman

& van Weele, 2005). Originally, ABC analysis is used as a tool for material management to evaluate the values of inventory of certain goods (Weigel & Ruecker, 2015). The main target of the utilization of ABC analysis is to enhance the efficiency of measurement management (Weigel & Ruecker, 2015). The simple idea is that in the A-group are the most important materials, which require the most effort from management and in the C-group are the materials, which require the least of managerial actions, and rest materials belong to the B-group (Chen, Li & Liu, 2008).

The ABC analysis starts by listing up the purchased materials and their prices (Weigel & Ruecker, 2015). It can be beneficial to identify the annual value per product, because that list can help the company to evaluate the size of potential benefits, which may be reached by the change of ways of manage those products (Iloranta & Pajunen-Muhonen, 2015). Next, the value of each separate material is assessed in percentages by combining the annual value of each material to the total annual value of all materials. After the percentage values are given the ABC analysis can be done, and materials are divided into A, B and C materials. The share of A-materials is 12 percentage of all purchased material volume and the value share of these materials is just under 80 percentage. The B-materials share is 13 percentage and value share is roughly around 15 percentage. The final group, C-material's share is 75 percentages from total material amount and value share around 5 percentages. (Weigel & Ruecker, 2015) ABC-analysis is presented graphically in the Figure 6.

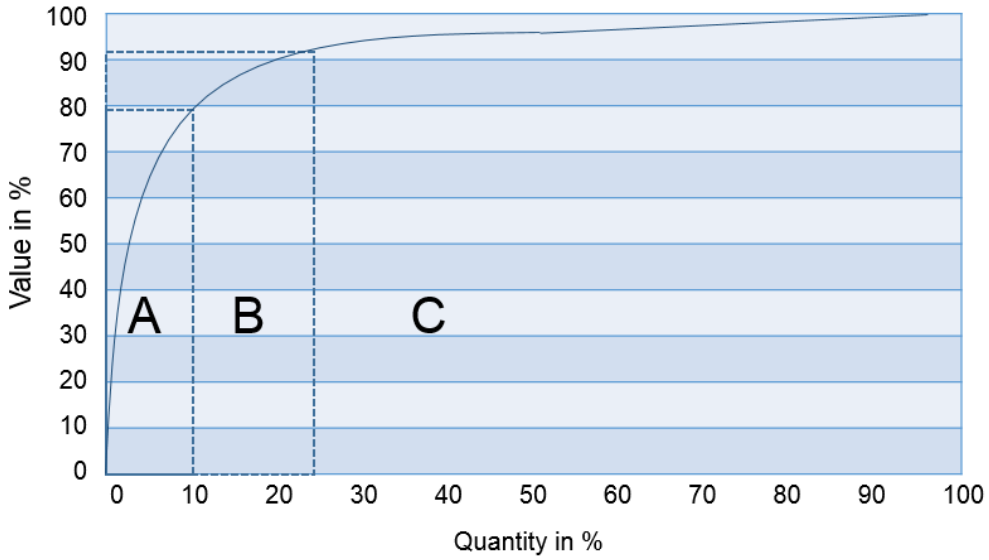


Figure 6. Graphic illustration of ABC-analysis.

Suitable strategies for each material group are defined. The purchasing market research, evaluation and analysation of measures is recommended for A-materials. As the stock value for A-materials is the highest one, the consignment stocks or just-in-time deliveries are recommended. The costs reductions should be started from A-materials. For B- and C-materials it is recommended to minimize the management efforts. The automatization and standardization of order processes and collective billing arrangement are recommended. It should be noted, that sometimes the B- or C-materials might require management efforts from purchasing because of the risk management or the strategic reasons. (Weigel & Ruecker, 2015) ABC-categorization has also gained some criticism from practitioners, as it takes into account only the annual monetary value of different materials, thus often managerial decisions may require notion of other attributes (Chen et al. 2008).

ABC-approach has gained criticism because even though the price of these materials is low, the strategic importance as a part of end-product might be critical (Drake et al. 2013). This confirms the opinion, that more strategic sourcing practices might be required for this product category. ABC analysis is totally concentrating only to the purchase spend, it does not take into account the costs of poor quality, performance or social risks or other competences, which might have effect (Gelderman & van Weele, 2005). For example, it is discussed, that products in C-category have

only a little effect for company's competitive advantage (Drake et al. 2013) and that is why the strategic purchasing activities are not usually performed. As stated before – C-category materials may have impact on company's production or warehouse activities, and ensuring of efficient processing of these materials may need strategic actions from sourcing.

2.3 Inventory management in sourcing optimization

A big part of product and sourcing optimization is inventory management. Typically manufacturing firm uses 56 percentage of its revenue to cover up the material purchasing costs (Monczka et al., 2002; Handfield, 2002). Into that amount should be added the inventory keeping costs for purchased materials, which are usually 30-35 percentage from the value of purchased materials, when taking the inventory costs into account the total costs can rise to a high level (Chase et al. 2002 cited in Wallin et al. 2006). Inventory costs can be divided into three categories: administrative costs, maintaining costs and shortage costs (Sing & Kumar, 2011). Order placing, reorder costs and set costs can be included in administrative costs. Inventory maintaining costs or holding costs are the costs related to storage charges, interests or insurances. Shortage costs are caused by out of stock situations and these cause profit losses. (Sing & Kumar, 2011)

When considering the issues just mentioned, it is not surprising, that companies are trying to search alternative inventory handling approaches to be more effective and to minimize the indirect costs caused by the inventory management (Wallin et al. 2006). Usually the stock carrying is expensive and that is why the purchasing companies are trying to reduce the committed capital of warehouses. Stock reduction can be achieved for example by just-in-time deliveries, by optimized order quantities or by ensuring the right time deliveries by more accurate forecasting (Baily, Farmer, Crocker, Jessop & Jones, 2008). Warehouse management is balancing between too high stock levels and too little stocks. The inventory management should aim to serve both internal and external customer to meet the requested service level, to secure the inventory levels that overstocking or bottlenecks are avoided, to keep the

cost at the lowest possible level by managing the lot sizes and to provide the visibility to all functions in up- and downstream (Lysons & Farrington, 2016).

Material costs have straight effect on inventory value, and sourcing should consider different aspects during sourcing decisions, for example, price movements, availability, shortages and physical and financial limitation, could all have effect on final decision (Baily et al. 2008). One way to reduce the inventory and buying administrative costs inside the purchasing company is vendor managed inventory, VMI (Claassen, van Weele, & van Raaij, 2008). VMI is a strategy for inbound logistics, where actually suppliers is the one who is responsible of customer's inventories by utilizing the requirement data offered by customer or buyer (Zammori et al. 2009; Claassen et al. 2008). In addition to reduced warehousing costs, VMI can also reduce the inventory levels, but help to reach savings through process and procedure simplification (Baily et al. 2008). VMI decreases the amount of transactions and improves the demand visibility between parties (Kaipia et al. 2002 cited in Zammori et al. 2009). Typically, products classified into C-category are turned into a vendor managed inventory (Baily et al. 2008). Overall, the purchasers and suppliers reach shared benefits; better service level, stock level reduction, and improved process speed by VMI (Zammori et al. 2009). To reach advantages through VMI, suppliers should have better visibility into buyer's forecasts and cooperation between parties should be enhanced (Baily et al. 2008).

While conducting the sourcing process it can be beneficial also take into account the company's internal material flow management. Optimal purchasing or delivery batch size is closely related to inventory management. The economic order quantity (EOQ) is widely known method for material purchasing (Min & Pheng, 2005). This method is introduced in next chapter. Two-bin system can be associated to just in time as a way to handle material flows and inventories in production floor (Miltenburg & Wijngaard, 1991). The principles two-bin system are introduced at the end of following chapter.

2.3.1 Optimization of purchasing and just-in-time purchasing

The main task for purchasing department is to provide the raw materials and other materials for production on the right time and on a reasonable cost (Benton Jr., 2010). Just-in-time, JIT, principles may help to reach those goals. Overall, the just-in-time purchasing is the key for whole supply chain, that the just-in-time philosophy can be implemented in the company (Handfield et al. 2009). The following principles are related to just-in-time purchasing. First principle is the reduction of order quantities. Based on this principle the ordering costs should be driven on the lowest possible level (Benton Jr., 2010; Gupta & Kini, 1995). The lower order quantities reduce the tied capital on warehouse and inventory turnover.

Second principle is frequent and on-time delivery schedules (Benton Jr., 2010), which means that deliveries are synchronized with the production schedules (Gupta & Kini, 1995). Then suppliers do not deliver the requirements for a long time periods. First and second principle can be achieved by frequent shipments with small quantities; this requires closer relationships between supplier and buyer (Handfield et al. 2009). As a side effect is raised up the delivery costs, but companies have tackled these increases by turning into a purchasing from a few suppliers, by freight consolidation or by using local suppliers (Mukhopadhyay, 1995). Actually on time deliveries are stated as standard objective of purchasing (Baily et al. 2008), that means that it is necessary to put efforts on that from planning point of view. That just-in-time deliveries can be achieved, it may require for example stable production schedules from buyer to supplier (Handfield et al. 2009; Mukhopadhyay, 1995) or buyer can give tighter instructions for suppliers, that delivery can arrive five days earlier and two days later, compared to requested delivery time (Benton Jr., 2010). The information sharing have to extensive regarding production schedules (Gupta & Kini, 1995). Mutual understanding and commitment of buyer and supplier about lead times and delivery times are crucial (Baily et al. 2008). The precise agreement forms the basis for the coming collaboration.

Third principle for just-in-time purchasing is reduced lead times (Benton Jr., 2010). This is important principle as if purchasing department wants to follow previous principles; the low lead times are in a crucial role to be able to maintain low inventory levels (Mukhopadhyay, 1995). Short distance between supplier and purchaser are also stated as requirements for JIT philosophy (Lysons & Farrington, 2016), which makes the lead time even faster, when the delivery time is minimized. The inventory levels decrease as the deliveries are done frequently and on time (Gupta & Kini, 1995). Lead time can be also reduced by long-term relationships and by agreed volumes, then no paperwork is needed and supplier can plan their production and inventory beforehand (Benton Jr., 2010). This can be achieved by continues information sharing between buyer and supplier, for example through electronic systems (Handfield et al. 2009).

Fourth principle is high quality of materials, this reduces the need of inspection of received materials. The insistence for this is that the purchasing party can trust the quality what supplier provides (Benton Jr., 2010; Lysons & Farrington, 2016). Also van Weele (2018) have stated that in JIT approach quality checks for each delivery are not needed to do, there should be mutual confidence, that the materials are delivered with high quality.

The last principle is reliable suppliers, which allow the maintaining previous principles (Benton Jr., 2010). In JIT approach, it is needed that purchaser and supplier have multi-year contracts. In the contracts the delivery times should be fixed, but the delivery quantities can be adjusted before the delivery (van Weele, 2018). Therefore the long term agreements between buyers and suppliers are needed (Gupta & Kini, 1995). By this way it is reached the goal that materials are delivered at the right quantity and at the right time (van Weele, 2018; Lysons & Farrington, 2016). Supplier base reduction is one way to maintain closer relationships with chosen suppliers, in JIT philosophy is mentioned that “fewer but better suppliers” (Benton Jr., 2010). In the following figure 7 is presented the principles of JIT purchasing and the benefits, which can be reached by implementation.

JIT purchasing principles	
Order quantities	Small lot sizes
Delivery schedules	Frequent, because of small lot sizes and low ordering costs
Delivery windows	Very narrow
Delivery lead times	Stringent and reduced significantly
Parts quality	Responsibility of suppliers
Supplier base	Only few suppliers

JIT

Benefits
Reduced inventory levels
Improved lead time reliability
Scheduling flexibility
Improved quality and customer satisfaction
Reduced costs of parts
Constructive synergies with suppliers
Costs decreases

Figure 7. Just-in-time deliverables adopted from previous literature.

After the just-in-time, principles are implemented and followed by purchasing department, what kind of benefits they can have. First of all the inventory levels are reduced, the lead time reliability is improved, in scheduling of purchases is more flexibility, quality and customer satisfaction are improved, costs per parts are reduced, more constructive synergies with chosen suppliers and finally overall costs are reduced (Benton Jr., 2010). In addition to these benefits, also the supplier performance can be measured more efficiently in just-in-time purchasing, because of more clear delivery instruction and closer relationship (Benton Jr., 2010). According to Lysons and Farrington (2016), with JIT philosophy the purchasing company can try to reach the following objectives: zero defects, zero set-up time, zero inventories, zero handling, zero lead time and lot size of one.

For optimal purchasing batch size calculation is developed method called economic order quantity (EOQ). The aim of this method is to help purchasing to order that amount of materials, which minimizes the total costs of required materials and inventory holding (Harris, 1915 cited in Min & Pheng, 2005). This takes into account the inventory costs for product, transportation costs, order placing costs and the price of the purchased item (Fazel, 1997). The problem with EOQ is that it aims the lowest price, to bigger lot sizes and infrequent deliveries (Min & Pheng, 2005). This means that company which aims to JIT principles cannot utilize EOQ, it is the decision between those (Fazel, 1997). This is a bit complex, as might be thought that economic order quantity is an efficient method for sourcing to decide the batch sizes. Despite of this previous studies have advocated that JIT is more efficient way to

purchase than EOQ (Fazel, 1997). Still for example Jones (1991 cited in Fazel, 1997) have stated, that if purchasers are able to count the stock carrying costs and other costs in EOQ right, it should end up to the same kind of batch size, as with JIT principles.

Supplier base reduction is often related to Just-in-time purchasing and partnerships between buyers and sellers (Odgen, 2006), and supplier base reduction is discussed later in this theoretical part. Previously in this thesis was mentioned that non-critical product should require efficient order processing. Efficiency may be reached by just in time ordering and strategy. The idea of lean supply is to provide products at a low price but also being focused on the waste removal (Drake et al. 2019). Lean supply aims to offer the products according to the needs and to keep up with service-level (Drake et al. 2019). It is sure that business world is full of complexities and this evolves the requirement of unique strategies (Gerderman, & Van Weele, 2002), based on this view, different sourcing strategies can be mixed and utilized for different categories of purchased products.

Overall, process optimization can be achieved by cutting the costs, by streamlining and rationalizing the processes and by improving the quality. Instead of bargaining and all time negotiating it is recommended to carry out more strategic actions. The automatization and standardization of potential categories freedoms the time of purchasers, to another more strategic tasks. The automatization is often recommended for the C-category materials. (Weigel & Ruecker, 2015). To achieve the more automated ways to purchase it is needed to carry out some strategic sourcing activities.

2.3.2 Inventory management techniques in JIT

In this thesis one inventory management technique which can be associated in to the just-in-time philosophy two-bin system is introduced. Two-bin system is defined to quite simple method to manage inventory and material flows. Two-bin system is a visual and on the floor inventory control method that can help company to reduce inventories and costs but also improves quality (Miltenburg & Wijngaard, 1991). The reason why only two-bin system is presented in this study is that two-bin system can

be recommended for routine materials, or other words for C-category materials (Nicol, 2010). The usage of these materials is seen regular and purchasing is seen to have a short acquisition lead times (Miltenburg & Wijngaard, 1991).

The materials in two-bin system are assigned in to the container, which have two separate bins. These containers should be located close to the production place, where materials are consumed. The main idea is that the materials are used from the first bin and after the first bin is empty the materials are taken from the second bin. The usage from the second bin gives a trigger to fill up the empty bin. (Miltenburg & Wijngaard, 1991) In two-bin system the material handling should be minimized (Nicole, 2010), because of the variation of requirements the delivery quantities should be calculated carefully. The filling up of empty bins of containers can be assigned to certain people, who are responsible to fill up the empty bind regularly (Miltenburg & Wijngaard, 1991). This way the availability of materials is ensured.

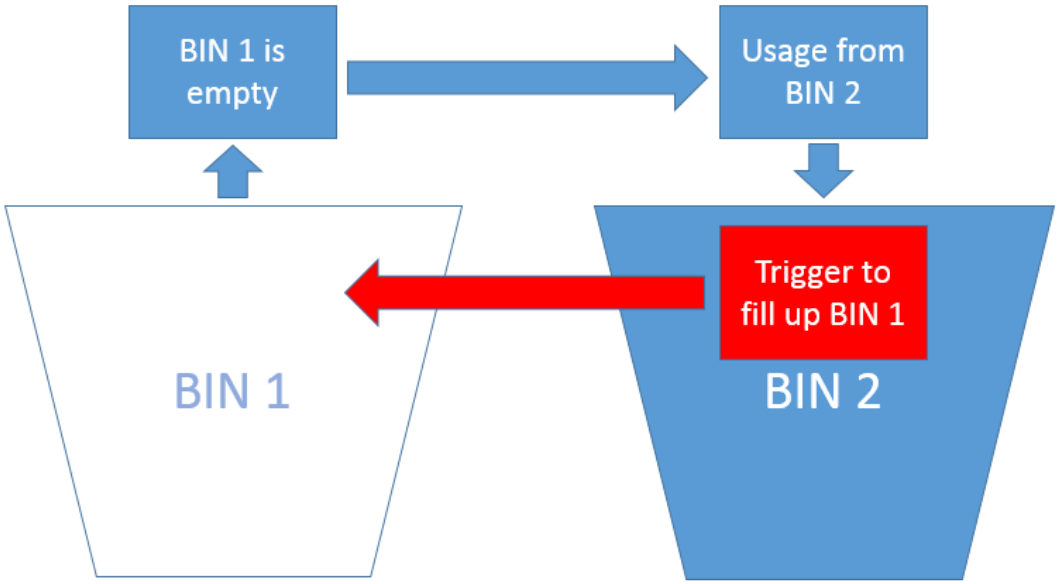


Figure 8. Simplified idea of Two-bin system pictured from Miltenburg & Wijngaard, (1991).

The benefit of two-bin system is that inventory is placed nearby the actual place where the materials are consumed which helps to eliminate the inventory transactions between productions and warehouse (Miltenburg & Wijngaard, 1991). It has

been estimated that two-bin system can reduce material inventory handling about 50% (Nicol, 2010). Second benefit is that the inventory can become more visible, when it easier to manage it (Miltenburg & Wijngaard, 1991). The paper work may decrease and overall production efficiency benefits from the utilization of two-bin system (Nicol, 2010). By two-bin system production employees can concentrate on more important materials, when they do not have to chase the routine materials (Nicol, 2010). By two-bin system the materials have their own bins which are located nearby the production place (Nicol, 2010).

2.4 Supplier base and transaction cost reductions

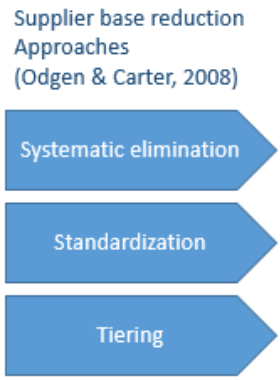
One of the most important strategic issue in sourcing function is supply base management and the amount of different suppliers is strongly related to that (Odgen, 2006). In previous literature is stated that usage of many different suppliers for certain category of products has been a strategic solution to decrease purchasing prices (Rittenberg & Tregarthen, 1999). Sourcing professionals have been encouraged to reduce supplier base and have more strategic relationships with only a few suppliers because this has seen as more efficient way of manage supply base (Odgen, 2006; Cruz, 1996).

The process when purchasing company determines the suitable amount of and mix of suppliers is called supply base optimization (Handfield et al. 2009). It is recommended to reduce the base of supply. It is argued that closer relationships with suppliers are automatically reducing the supplier base (Benton Jr., 2010) and by that relationships can became more manageable (Song, Dong & Xu, 2014). With reduced supplier base manufacturers may gain cheaper unit costs when suppliers may get more stable and larger demand (Song et al. 2014). In supply base optimization, or rightsizing, it is typical to reduce the amount of suppliers, then suppliers who are not able to achieve the best results or are not competitive enough, are eliminated from the supply base (Handfield et al. 2009). This process is started by the evaluation of the current supply base and by the evaluation of how the situation can change in the future and which suppliers are needed for specified material group (Handfield et al. 2009).

In the related literature are found out three different approaches on how to reduce the supplier base (Odgen & Carter, 2008). First one is systematic elimination, which can be carried out by competitive bidding, this approach is more strategic way to reduce the supplier base (Womack et al., 1991). In this approach, the suppliers are evaluated more carefully. Sometimes this approach requires only the deleting of selected suppliers from purchasers database, typically, these suppliers are not utilized during selected time period. (Odgen & Carter, 2008) The second way to reduce supplier base is standardization (Womack et al., 1991). This approach may require the standardization of the end product. By standardization the required materials can be purchased only from a few different suppliers instead of many sources. (Odgen & Carter, 2008) Last approach is tiering (Odgen & Carter, 2008). In tiering purchasers change to buy from first-tier suppliers the materials which are purchased from second- or third-tier suppliers. In this approach the old suppliers are still in the supply base, but the direct contact amount has decreased. (Cousins, 1999). Still this approach can be included in the suitable methods, because direct contacts between buyer and supplier have decreased, and less relationship to be maintained will exist (Odgen & Carter, 2008).

Handfield, Monczka, Giunipero & Patterson (2009) have identified the main benefits for optimized supply base. By optimization, purchasing company is buying from world-class suppliers, use full-service suppliers, achieve supply base risk reduction and lower supply base administrative costs, total product cost are reduced and have ability to pursue complex supply management strategies (Handfield et al. 2009). Based on the previous studies case companies have reported some benefits which they have perceived after reduced supplier base (Odgen & Carter, 2008; Faes & Matthyssens, 2009). These benefits were availability and capacity improvements, increased flexibility, better information sharing, lowered inventory levels, quality improvements, unit price and transportation cost reductions and increased service, responsiveness and innovation (Odgen & Carter, 2008), improved management and profitability of operations and relationships with suppliers (Faes & Matthyssens, 2009). After reduced supplier base buyers have more time to develop better relationships with suppliers, who they see more strategic ones, and on the other hand

this increases company's competitive advantage (Goffin et al. 1997). According to Baily et al. (2008), single sourcing can lower the purchasing prices. Price reductions are resulted from the higher order units. Because the scheduling of deliveries is easier with a few suppliers, the transportation costs can decrease. In the situation with a few suppliers, VMI or other stock handling ways are available, also suppliers are more motivated as they have bigger volumes. In single sourcing the buyer receives better service. (Baily et al. 2008)



Identified benefits of supplier base reduction

Handfield et al. 2009	Odgen & Carter, 2008	Faes & Matthyssens, 2009
World class suppliers	Availability and capacity improvements	Improved management
Full service suppliers	Increased service	Better relationships
Reduction of supplier base risks	Better information sharing	Improved profitability of operations
Lower administrative costs	Lowered inventory levels	
Lower total costs	Quality improvements	
Supply management strategies	Lower unit and transportation costs	
	Increased flexibility	

Figure 9. Supplier base reduction approaches and benefits.

On the other hand, some risks related to the supplier base reduction should be highlighted. First issue is the question, is the supplier encouraged to raise the prices if no other suppliers are in the supply base (Baily et al. 2008). Faes and Matthyssens (2009) have stated that increased prices are one of the risks for reduced supplier base. With multiple suppliers there are different suppliers available. If the current supplier will face delivery problems, because of productions interrupts or natural phenomena there can be another supplier who is able to cover the needs of the customer (Baily et al. 2008), therefore a single or a dual sourcing may increase the risk of supply disruptions (Faes & Matthyssens, 2009). The buyer's dependency on supplier in dual or single sourcing situation is increased (Faes & Matthyssens, 2009. This may evoke some challenges if it is later needed to build up new relationships with old or new suppliers (Baily et al. 2008).

By supplier base reduction the administrative and total costs can be reduced therefore the transaction costs should be introduced in this phase. Chu (2004 cited in Wei & Chen, 2008) states that ordering costs, holding costs and under stock costs can be defined as transactional cots in purchasing. Companies are encouraged to reduce transactional costs by decreasing the internal cost, external contracting cost and external contracting cost to enhance company's operational performance (Wei & Chen, 2008). Dietrich (1994) have divided transaction costs into ex-ante and ex-post costs. Searching, negotiating and contracting costs are part of the ex-ante costs. In ex-post costs are included maladaptive, haggling, setup and running and monitoring costs. (Dietrich, 1994)

After the transactional costs are explained the transaction costs economics should be introduces. The most simply explained, the transaction costs are the costs that are caused by any exchange between different parties (Luzzini et al. 2012), or whenever a service or good is changing the owner from a provider to a user (Sambasivan, Deepak, Salim & Ponniah, 2016). Luzzini et al. (2012) divide those costs into the three types: information costs, negotiation costs and monitoring costs (Luzzini et al. 2012). The transaction that occurs inside the company may include costs, like managing and monitoring or purchasing inputs, capital equipment and the transactions that are happening outside the company can be related to searching and information costs, bargaining costs or policing costs (Sambasivan et al. 2016). TCE or transaction cost economics suggests to minimize the transaction costs so that the resources can be distributed in to another activities (Carter & Hodgson, 2006 cited in Luzzini et al. 2012).

Overall, the rationalization should improve costs, quality, deliveries and information sharing between both parties. It is more efficient to manage only a few suppliers than the many different suppliers (Handfield et al. 2009). As stated in previous chapter just-in-time principles also require reduced supplier base, that the interactions and costs between buyer and sellers are minimized.

3. RESEARCH METHODOLOGY AND DATA

In this section the research methodology of this thesis is presented. The aim is to find out why it might be important to conduct a sourcing process for purchased C-category or routine products. By this study the suggestions for a case company are presented, these include the choices to harmonize the material sourcing. In this chapter an insight to research methodology is given. After the methodology is explained an insight to the data collection method and interviews is given. Finally, in this chapter the data analysation methods are explained.

3.1 Methodology

A single case study is the strategy of this thesis. As the aim of this study is to find out the best suggestions for a case company to do their business the case study is the most convenient research strategy. According to Ellram (1996), the case study aims to find the best practices to the problems. Case studies are stated to be useful especially when the aim of the study is to assess the real life examples (McCutcheon & Meredith, 1993). Another advantage that case study gives is that case study allows researcher to make observations in the actual business field (Seuring, 2008). In this study is needed to combine the qualitative and the quantitative data. The data is gathered from the real business environment and therefore it is beneficial to use the case study as a strategic line. The case studies are useful when the company is willing to change (Kjellén & Söderman, 1980 cited in Halinen & Törnroos, 2005).

Now that the strategy of this thesis is explained it is time to open the research method. The research method of this study is a qualitative research. According to Ketokivi and Choi (2014), the qualitative research can be explained to be “an approach that examines concepts in terms of their meaning and interpretation in specific contexts of inquiry”. The qualitative research is aiming to reach analytical generalisations (Mitchell 1983 cited in Dubois & Araujo, 2007). The aim of this study is to combine different suggestions that are formed from tenders and research results.

3.2 Data Collection

The data used in this thesis is mainly qualitative. The qualitative data is collected by interviews for the case company's employees. According to Yin (2003), the interviews are seen as typical data collection methods for case studies. Quantitative data is gathered through electronic tender system and by from company's EPR system. The researcher uses this numeric information, and it is not shared public in this thesis because the data in confidential. The aim of quantitative data is to offer broader view of investigated topic for researcher and possibility to make suitable suggestions in the empirical part. As an interview method is used semi-structured interview, which means that interviewer asked the questions in the same order for each interviewee and interviewees answered the questions in their own words (Eskola & Suoranta, 1998). This interviewing method gives more room for open discussion and it is the most suitable option for this study. It is seen that interviewing is an efficient way to gather empirical data (Eisenhardt & Graebner, 2007).

The interviews were audio-recorded. As the spoken language during an interview was Finnish, the researcher translated the interviews in English, which is the language of the study. This way the data is more usable in the analysation phase. After the interviews are held the researcher analysed the gathered data. Based on the answers researcher formed a data, which is used as a selection criteria for supplier selection after tenders. In supplier selection and formulation of final results the interviews and numeric data were utilized to make the final proposals for the case company.

The interviews were held for production employees, who are using these materials in the production daily. The employees from production are working in the different tasks or they have different responsibilities in production, and by that, the researcher got the different perspectives. In the following table 2 is presented the amount of interviewees and their organizational functions.

Table 2. Interviewees and their organizational functions.

Interviewee	Organizational function	Interview method
Interviewee 1	Production	Face-to-face
Interviewee 2	Production	Face-to-face
Interviewee 3	Production	Face-to-face
Interviewee 4	Production	Face-to-face

Next the data analysation method is clarified and after that the case background is explained.

3.3 Data analysis

The used data analysation method in this study is content analysis. In content analysis the aim is to investigate the written text by specifying, by finding differences and similarities and by summarizing. By content analysis, the researcher is trying to form a picture of investigated topic that combines the analysis into the context and previous literature or research. The analysed data can be in written or numeric form. (Tuomi & Sarajärvi, 2002) In this case is analysed written interviews. During the content analysis the analysed data is spliced in the different aspects and those aspects are coded, by doing this the data is organized into the new form (Tuomi & Sarajärvi, 2002).

After the answers were translated into the written language of this thesis, the answers were shared into categories and colour coded for further analysis. There were identified three different categories from interviews and for these were given titles in analysation phase. Inside those categories, the answers were coloured in the smaller groups, which helped to form the paragraphs to the analysation part. Each colour has own paragraph in the empirical analysis.

3.4 Background of the case

In this chapter the current situation of routine or C-category materials are clarified. How the purchasing is handled currently and what is the overall scope for this category. Also the reasons why this research is conducted are clarified. After this the analysation of interviews is presented. The interviews give a broader view about everyday working with routine materials.

The case company is Finnish company working in the food industry. The company acts in Finland, in Baltics, in middle Europe and in northern countries. The company employs over 2000 people in thirteen countries. The case company has observed a need to reshape the ways of source certain materials. The management ways are seen as too fragmented and inefficient in current situation. Currently there are 21 different SKUs, stock keeping units, in this routine material category. These materials do not own unique characteristics and therefore these materials can be called as standardized materials. This means that substitutes are available in the markets and purchasing is possible from the different sources.

In current situation the case company purchases these 21 routine materials from 9 different suppliers. There are two suppliers in supplier base, who are delivering only one materials. Four suppliers from current supply base are delivering two materials and two suppliers who are delivering three materials. In current supply base is only one supplier who is delivering five different materials for the case company. In current supply base, the material flows are not efficiently organized. Too many suppliers for only one or two material SKUs exist in current situation. This kind of fragmented supplier base increases the amount of different transactions. The amounts of purchase orders, deliveries and invoices are quite high. In the figure 10 is pictured current situation.

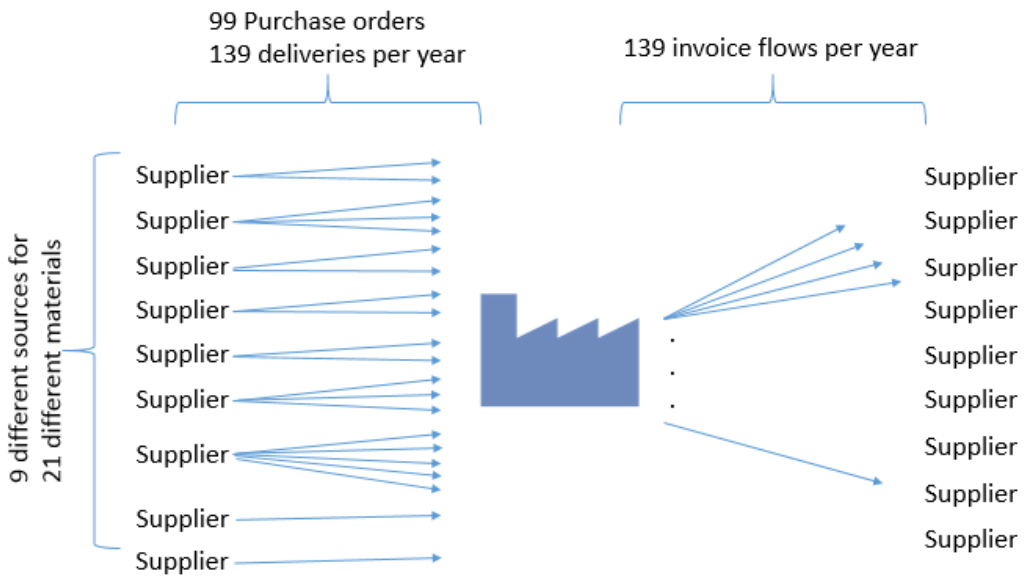


Figure 10. Current situation in the case company.

As can be seen from the figure 10, in current situation there are many different transactions between sourcing and different suppliers. Currently case company is using 9 different suppliers for 21 different SKUs, this means that approximately company is purchasing two or three materials from one supplier. Currently the amount of different purchase orders is 99 per year. One order may include many purchase lines, which are not delivered at once. This can be seen from the amount of goods receipts, which is yearly 139 pieces. The yearly amount of invoices has increased as currently the case company receives materials from different sources and plenty of deliveries from multiple sources are done. In current situation company receives one invoice per delivery, so it takes 139 invoices per year.

Researcher has estimated that the activities relate to purchase orders take 5 minutes per order, this time includes creation of purchase order and checking of order confirmations. On a yearly level the time used in purchase orders is around 629 minutes which is 10 and half hours per year. The time used in purchasing of the routine materials is over the one day's working time. It should be highlighted, that in this time calculation is not included the possible reclamation processes or other possible errors, and this calculation is based on smooth sourcing process without interruptions.

In addition to the amount of different transaction, it is important to take a look into the stock levels in current situation. Currently the case company does not have any system to manage the routine material warehousing or flows from warehouse to production. Warehouse makes the goods receipts for materials and production picks up the materials from warehouse when needed. From the sourcing point of view, there is no evidence of planning of suitable order sizes. The materials are ordered based on the old data in ERP system. Neither exist evidence that the stock values of these materials are analysed before. Therefore the stock levels and sock values can increase periodically because the material flows are not steady. In the following figure 11 is pictured the fluctuations of stock values of routine materials.

The percentage number is based on the comparison between the monthly value and the average value from the 2018. From the figure 11 can be seen that in September 2018, the stock value of routine materials has been 29% higher than the average value of the whole year. As a contrast in some months, for example in March or April 2018, the stock values have been 13 % less than what was the average from the year 2018. This shows that material flow management from suppliers to the case company have to be reorganized. By reorganizing it is possible to standardize batch sizes and delivery times.

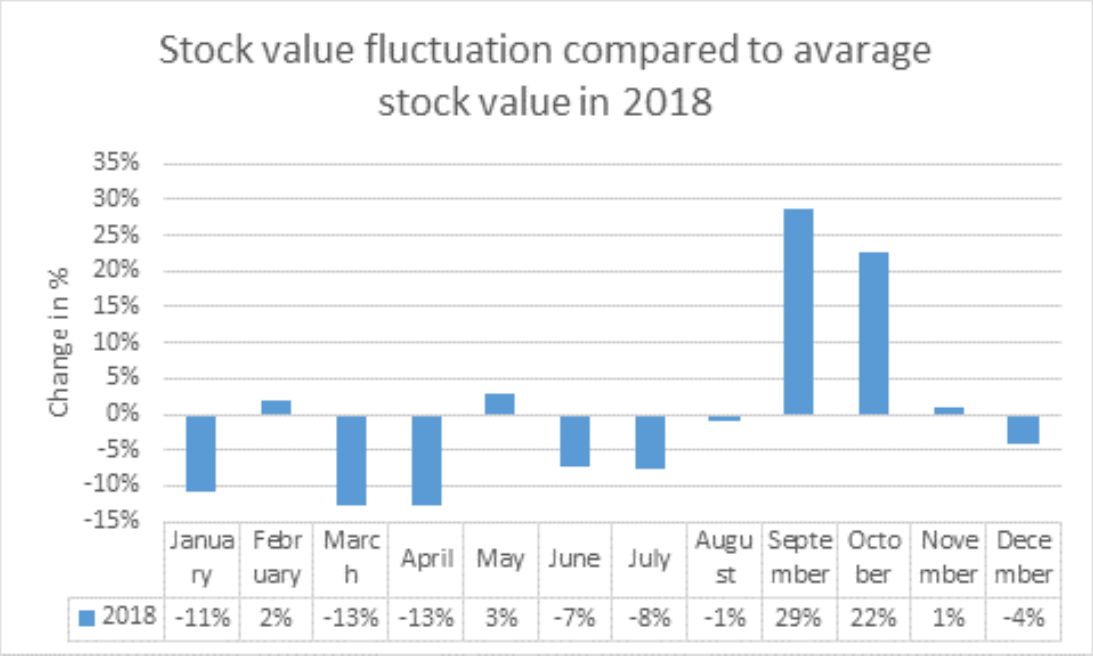


Figure 11. Stock value fluctuation in 2018.

Currently, the value of days in stock of routine materials change radically because of the variation of inventory stock value. This gives an indication to try to handle material flows more efficiently. Another indication for the company to handle these materials more efficiently is days in stock number. The average days in stock number in 2018 was 74 days, which is quite a lot for the materials, which are easily available. It means that in average company has these materials over two and half month requirements, which increase inefficiency. Days in stock is the followed KPI, key performance indicator, in the case company. Days in stock measures the efficiency of sourcing function. It is identified that current variation and inefficiency have evoked the case company to search alternative ways of working, so that the efficiency would increase.

The aim is to harmonize and optimize the product category of routine materials. This optimization can effect on the case company's internal material flows and warehousing principles. The effectiveness is highlighted as very important aspect in the case company's strategy. Because of that this category is taken under the investigation. The case company wants to know what can be done and what kind of benefits might be reached. In the next chapter, the results of interviews are discussed.

4. EMPIRICAL FINDINGS

This chapter presents the empirical results of this study and forms the background for the suggestions given to the case company.

4.1 Quality as the leading factor

When considering the importance of routine materials for the case company's production, it is easy to start thinking through quality and possible quality defects; what those may cause for production. When this was asked from the case company's production employees, the clear statement was that the materials are important for the production.

Interviewees were asked to tell, have they faced any problems or challenges with the routine materials. All of the interviewees answered, that yes, they have faced some problems with routine materials. Interviewees stated that they do not face the problems very day, but sometimes. They highlighted that some of the routine materials have more quality problems or other problems with machine run ability than with some of the materials and some of the materials are working properly all the time. The problems can be dependent on the material characteristics. It was surprising that some of the routine materials are working all the time. Some of the interviewees highlighted that, with some of the routine materials the challenges in production are ongoing problem. Based on the interviews can observe that the variation with machine run ability between different materials can be enormous. In this case we are talking about the different materials, for example with material A the company can face problems, but with material B problems are not faced.

> *"With one material we have had many problems and the quality is really bad." (Interviewee 1)*

It was discussed about the variation of different materials, but interviewees highlighted that the material quality of certain material may vary also. That means that the case company can face the problems with the materials delivered by the same

supplier. Sometimes the quality defects might be caused by transportation. Because of this the materials can be too defected and it is not possible to use those in the production. It is obvious that this kind of sudden quality problems cannot be predicted, but still those should be avoided as well as possible. For example, the transportation defects may lead into the situation when materials cannot be used at all and everything have to be destroyed, described one interviewee. The production wishes the better quality management because consistent quality is highlighted strongly. This can be assumed from the interviewee's answers. The unexpected problems may cause challenges, if no more material is in the warehouse and production have to make another plans to cover up the situation and continue production.

> *"It varies. Sometimes when the history of some materials and supplier has been good, the problems might evolve suddenly. Of course we are hoping the consistent quality. So even if the quality is mainly good, some deviation can happen." (Interviewee 2)*

> *"-- sometimes there can be some kind of transportation defects, and then it is not possible to use the material." (Interviewee 1)*

In the situations when material is not available because of the bad quality or because of the out of stock situation, the production might face difficulties. Sometimes the production may be stopped because of the problems with routine materials. This rise the importance of these materials even higher. If it is needed to stop the production machines because of the routine material, it can be said that the material is important from the production point of view. According to the interviewees, the material problems or lack of material, can overall cause a lot of extra work in production. The interviewee 1 highlighted that production have to improvise sometimes and try to figure out how to continue the production without the routine material. The same interviewee was worried about the delays and that the delivery of the end product for the customer might be delayed because of problems with routine materials.

> *"If we do not have material in stock at all, we have to improvise in production and make changes in material packaging. Of course, this can slow down the deliveries for our customers. Of course, it has a lot of meaning for production." (Interviewee 1)*

Based on the interviews can be observed that the customer's requirements are closely related to the level, as how important interviewees see routine materials. This was a surprising aspect that even though that they are not closely in contact with the case company's customers; they are still aware that the routine materials are important part of the end product. This increases the importance in their minds. For example interviewee 3 defined this issue by the end user's needs, that the quality problems can cause also problems at the end user level. It is seen that even though the production would be able to pack the product despite of quality issues, the problems are moved into another level of the product life cycle. If we think about the work load again, the workload in this situation is turned into the case company's customer service, as they can receive the notions and reclamations from the end users or customers. The path and consequences may reach far away from the company's productions itself. This encourage the idea, that even though the material might be unimportant, the quality or the total absent of the certain material may cause problems.

> *"If we have quality problems and try to package our product despite of that, we might not reach the perfect quality for our end products. And then we might receive multiple reclamations and notions from our customer or end users." (Interviewee 3)*

Mainly the message from interviews was that these routine materials are very important for company's production. There was a one interviewee who raised up the issue that a few of these materials could be removed from product range and from the bill of material of the end product. This means that not all of the routine materials have the same kind of importance. As analysed above, the availability of different materials may vary, but also can the importance level. Production employees may have clear view of different materials and of the usage in production that is why they

might have the best answer whether the material should be considered as necessity or as useless. All the rest have the mind-set that all of the materials are needed and are important from the production's point of view.

> *"The importance of some materials is very high. But I see that there might be even some materials that can be left out from our product range." (Interviewee 3)*

In the interviews it was asked which kind of problems the production employees might face, if challenges with routine materials would occur. Every interviewee highlighted that production might be stopped because of the problems with the routine materials. One interviewee said that if they have the material with bad quality they first try to change it into another available material from warehouse. If that material is not working at the first time, generally they have to try a few times more to get it working. If the material is still not working, they have to stop trying. It can be heard from the sentence and the weight of the tone, that some of the interviewees might have been in the situation where routine material is not working properly and they have had to try different ways to get it working. This can be frustrating for the employees. A few interviewees were worried about extra working or re-working. If the routine materials are not working in the production the employees might have to make a double work and repack products or repeat some parts of the production phases. They said that this kind of work is done manually when even more time consuming work have to be done. This kind of work creates inefficiencies for the production.

> *"For example if we face quality problems, it means more work and sometimes production might be stopped because of that. Sometimes we have to slow down our machines, when effectiveness of our machines suffers because of material quality or material problems. That might lead also to material scrapping, which is always a bad thing." (Interviewee 4)*

Quality issues with the routine materials may cause problems by stopping the production. One interviewee noted that the material with bad quality increases all kind of working, in addition to the inefficiency in the production phase, the material with bad quality have to be handled in the certain way. One interviewee explained that the materials with bad quality have to be blocked from material inventory, and then removed from production into the named place. After this the production employee have to inform people who are responsible to handle these defected materials. All of this requires manual work and consumes time from production employees whose time should be targeted into the production of end products. As cited in the quotation above, material scrapping is not a sustainable way to work. The material waste have to be minimized in the first place and quality assurance and quality management have a huge role to avoid it. In addition to this a few interviewees weighted that some of the routine materials cannot be replaced with other current materials as each material is unique or run ability on machines is weak with alternative material. This means that even though there are available many different alternative suppliers on the markets, the challenges might occur so suddenly that the possibility to get more material is not possible or the materials on the markets are not working in the case company's production. Then the production faces huge challenges. Could be surprising that routine materials can perceive this many different aspect to take into account while selecting sourcing strategies.

> *"Quality problems can of course cause a lot of more work related to material blocking, or informing of other stakeholders. It can be seen that some of the materials cannot be replaced, and when the last pallet of material is bad quality, we really have problems." (Interviewee 2)*

Overall, the quality can be seen as very important topic in the field on the routine materials. The sourcing's stake holders can give important and notable aspects, when trying to evaluate the sourcing strategies. Some of the materials that are considered negligible can really have effect on the overall efficiency of production. The problems with routine materials can influence on the minds of end customers also. While considering new sourcing strategies with the routine materials, production

should be listened. One interviewee concluded the issue with overall quality very well:

> *"I would like to say that when we are not going to consider the quality and when we accept the bad quality; we can stop the production and leave our business. Quality is very important." (Interviewee 1)*

4.2 Inefficient warehouse management

Interviewees were asked to give their opinions about the current material flow handling and inventory management ways. All of the interviewees told that currently the material flow management from material warehouse to the production is mainly handled by verbal communication. Some of the interviewees thought that current material flow management is working properly and challenges are not faced. Some of the interviewees thought that current ways are unclear and inefficient. The ones, who thought that the current method is suitable, highlighted that it is the most important that material availability is secured. Currently they have a few people who are dedicated to secure that enough routine materials are available for the production's usage. Even though that one interviewee stated that current methods work well, they have faced problems with breaks in the information flow. The interviewee who said that current system is working well noted that the people who are responsible to fill up the materials requirements have to be reminded verbally to do the fill ups. This means that despite of current agreement the work flow is not efficient. Otherwise they have to pick up the materials from the warehouse themselves.

> *"It works pretty well. We have a few people who are responsible to fill up the production's needs. We just have to ask them to bring more material. Mostly this is about verbal communication. These dedicated people should take care of material availability by themselves, but mostly we have to remind them to bring more." (Interviewee 4)*

One of the interviewees, who told that people to handle the routine materials flows exists, raised up one interesting aspect. Interviewee told that currently they are actually collecting the routine materials by themselves from the material warehouse to production's usage. Interviewee stated that this kind of method works efficiently because the employees do not have to wait for someone else to fill up the requirements. This kind of self-service might be problematic, as some of the packaging sizes are that heavy or huge, that the moving without suitable equipment is difficult. Based on the interviews can be observed that people are too used to work in a certain, inefficient way because current agreement is not followed. This had lead into the situation where people do what they have to do to secure the material availability. Need to clarify instructions and overall material flow management are required.

> *"If we take the materials by ourselves, it works well. Then you do not have wait for someone else and it is more efficient to collect materials from warehouse to production by ourselves. - Some problems in material movement might be with too heavy packages, and then we cannot move those by ourselves." (Interviewee 1)*

One interviewee stated that there is dedicated people to be in charge of material fill ups, but still some kind of verbal communication is needed also between different shifts. Interviewee told that previous shift should take care of that those dedicated people are informed to bring more routine materials in the production. The whole managing system is formed based on the idea that there should be a certain people who is in charge, but in practice, it is not working. Three of four interviews mentioned, that those people in charge, have to be informed separately, by the current shift personnel or by advance by previous shift, so that enough routine materials are available. From the answers can be noticed some kind of uncertainty against current system, one interviewee mentioned that it is aimed to fill up the need when, for example, only one box of some material is left in production.

> *"Currently our aim is that when the user notice that for example only one box is left of certain material, he informs it further and someone*

> *brings more material in production, the aim is to react in advance that the material do not run out from production." (Interviewee 2)*

After the current material flow management system was identified during interview, the interviewees were asked to tell about the possible problems with current warehouse management. One interviewee gave really strong opinion that actually they do not have any kind of materials management system for routine materials currently. One point in this argument was that they do not have certain places for each separate routine material in the warehouse and that no dedicated people exists currently, whose full responsibility would be the material flow handling. The bigger problem in that argument was that the warehouse management is too unclear because no named places for the routine materials are marked and that cause more work to find those routine materials when needed. It can be assumed that as this interviewee gave this kind of viewpoint, this people might have faced the problems with current system. This interviewee highlighted that unclearness consumes employees' time, as materials cannot be found easily.

> *"For now, we do not have any control for warehousing of these materials. We have too unclear places for materials, and we do not have a dedicated people to handle these. We should know where to find certain material. That when it is really hurry you are trying to look for the material from a certain place, where it was located last time, and you cannot find it there, it or course cause more work to try to trace it and time consumes." (Interviewee 3)*

In addition to unclear management system, a few interviewees highlighted that the current material warehouse is too small for current needs. They stated that the current material warehouse is too small and that not enough shelves for routine materials are placed. According to the one interviewee, specified shelve for routine materials exists currently where the needed materials are restored and from the materials are collected to the production's usage. The problem with that is that not the own named or numbered shelf places for each routine material are stated. This cause problems as routine materials have to be searched from different places of

the shelf when those are needed. In addition to this, sometimes the routine materials are not even restored to that certain shelf then the searching process will take even more time. Another interviewee was worried about the stock situation accuracy in the ERP-system. According to the interviewee, the materials can be restored anywhere around the warehouse and suddenly get lost because of this the material stock levels might not be accurate in the system. This has lead into the management way that the safety stocks are increased to secure the material availability. This kind of working ways are not seen efficient, even from the production's point of view.

> *"First of all we have too little amount of shelf locations in our warehouse." (Interviewee 2)*

> *"Now we do not have enough space in warehouse and no certain and named shelf places for each material, which might cause problems. There is also problem that we cannot trust our stock situation, which leads us rather have high safety stocks than too little material stocks." (Interviewee 3)*

After the problems were identified the researcher asked if the interviewees would have own recommendation on how to improve internal material flow management of routine materials. The straightforward answer from one interviewee was that the warehouse should be bigger, as now each certain material do not have certain named place. Secondly was raised up the requirement to have the named shelf places for each routine materials when the collecting would be easier. Only one interviewee had an opinion that the material fill up, from production to warehouse, should be done by each and every one by themselves. Even though this interviewee highlighted that some of the packages are too heavy to be moved without a help of people, who has capabilities to use equipment to make the movements.

> *"Bigger warehouse, with direct shelf locations for each material would help material warehousing management." (Interviewee 2)*

Two of the interviewees thought that there should be dedicated people to handle the internal material flow of routine materials, from warehouse to production. One of these interviewees suggested that there should be a person whose responsibility would be to track the material stock and fill up the requirements of routine materials. Another of them said that, that certain people should carefully trace the stock situations. The same interviewee noted that the material consumption on machines with routine materials varies from 20 minutes change time to 8 hour cycle time. This means that the material availability have to be secured in a different ways for different materials. And also that the fill up amounts and cycle times are different. This kind of matters bring more importance for the planning and tracing.

> *"I would say that the people, who are responsible to fill up the material requirements, should follow up the material stock situation more carefully. Currently we have typically one box of material on a machine and some of the materials have separate cabinet in production where is more material available, and when it used from machine, more is taken from the cabinet. The fill up cycle on machines varies, as some materials are required to change into new reel or box every 20 minute and some every 8 hour time cycle." (Interviewee 4)*

Production employees have identified that current material warehousing systems are not efficient enough for company's current requirements. Interviewees highlighted that too much is based on the verbal communication and people's memory. This cause mistakes because people are responsible to handle several routine materials on different machines without a clear management system. Some of the interviewees were happy about the current management ways, but mainly the opinion was common; currently the working is too unclear and too inefficient. All of the interviewees gave improvement ideas, which confirms the evidence, that there something should be done, so that the working with routine material flows would be more efficient.

4.3 What to take into account in sourcing function

This section discuss more about sourcing related questions and about what kind of issues might have effect on sourcing decisions. In interview the interviewees were asked to give their opinion about current batch sizes for routine materials. It was a clear opinion from each production employee that they cannot say anything about the delivery batch sizes. Their task is to collect the routine materials from warehouse. One interviewee highlighted that they have not faced out of stock situations with routine materials. This means maybe delivery batch sizes are not too small. The same interviewee highlighted that currently the case company is forced to use too high safety stocks. It is clear that visibility from the sourcing to the production is not satisfactory about how the company is currently planning the delivery batch sizes. One interviewee stated that some of the materials are packed in a way that pallets are too high. This cause problem when materials are needed to from the pallet. When the pallet is too high it can cause a safety risk. Materials can drop down from too high pallet. It is beneficial to take this kind of practical things into the account while planning pallet sizes.

> "-- there might be even safety risk while trying to open material package, which is very high." (Interviewee 1)

Interviewees were asked to give feedback for sourcing. Two of the interviewees recommended that purchasers should go to the production and talk more with the people in production in face to face. According to the both of these interviewees, in this way it is possible to get straightforward feedback about material quality problems and material functionality. It can be read from the interviewees' answers that they are not happy with the current communication level between sourcing and production. Both of these interviewees thought that it can be beneficial to improve the communication level with routine materials.

> *"I would like to communicate more face to face with sourcing. Sourcing could come sometimes into the production and ask straight from production employees how is it going with current materials." (Interviewee 4)*

Two of the interviewees had a feeling that sourcing is not considering routine materials as important as those might be. They thought that the sourcing pays less attention against routine materials than against other for example strategic materials. Both of these interviewees reminded that routine materials are important for company's production and are needed as a part of the end products. One interviewee said that routine materials might require even more working power in production than for example strategic materials. Because of that product functionality and stable quality are important for routine materials. One interviewee highlighted that the importance of routine materials cannot be noticed too late, when problems on machines are already faced or when the material is already out of stock. Based on the interviews it is quite clear that something should be done and improved in routine material sourcing.

> *"-- Sometimes it feels like the priority is somewhere else, in more important materials, and then you notice the importance when the materials are out of stock or are not working properly. –" (Interviewee 2)*

One interviewee highlighted that routine materials should be tested in the production before the final decision of purchasing of certain material. Tests are required when the supplier for the material might change even though that the material specifications stay as the same as before. Before the final decision should be confirmed that the material is working properly in production. This same interviewee said that the searching of new suppliers is beneficial but the routine material functionality have to be secured. This interviewee highlighted that the final decision should not be based on the price.

> *"It is important to test materials before the buying; we cannot be sure how some materials are working on our machines. Despite of the fact*

that these are just routine materials, we have to test materials first." (Interviewee 3)

Interviewees were asked to tell their opinions about suitable supplier selection criteria. All of the interviewees highlighted that the quality is the most important criteria. As stated before, the quality problems of routine materials can cause problems in production. Because of that the availability of routine materials have to be secured from the interviewees' point of view. One interviewee highlighted that delivery accuracy would be important to set as supplier selection criteria for routine materials. This same interviewee added that the price should not be that important criteria, but interviewee understood that from the sourcing's point of view price might be important. From the sentence can be read that this interviewee thought that sourcing decisions might often be based on price. One interviewee mentioned that quality, price, delivery accuracy, service, reliability, location, and technological capabilities should all be considered as important criteria and that it is difficult to leave any of those aside in decision making. This same interviewee highlighted that of course, the quality should be the number one criteria, but flexibility from the supplier is also important. Overall, the common message was that quality is the most important criteria because the functionality on machines have to be secured. The production effectiveness is dependent on the routine material quality, stated one interviewee.

"Consistent quality definitely and delivery accuracy. About price I cannot say anything but maybe sourcing is interested of that. But quality and delivery accuracy definitely." (Interviewee 2)

Lastly, in this section is discussed about the interviewees' opinions against harmonization and optimization. One interviewee answered that it does not bring anything to mind, and did not answer on the question. Two interviewees stated, that it would mean good quality and quality assurance. One interviewee highlighted that the harmonization and optimization mean consistent material quality and consistent functionality on the machines. One interviewee stated that the harmonization and optimization mean that the routine materials should meet the settled requirements and that the deliveries should be on time. Third interviewee said that the harmonization

and optimization are about to how materials are working in a more optimized way, that deliveries are on time and that the quality of materials is stable. The interviewees see that optimization and harmonization mean assurance of material quality, clear agreements between supplier and buyer and especially punctuality but also flexibility.

4.4 Follow up of sourcing process

In this chapter the sourcing process and how it has been followed during this optimization process are presented. In this section the supplier selection criteria is clarified. First of all the whole process started by the problem identification, which is presented in the previous chapter. The case company has recognized the need to harmonize the purchasing procedures of certain products. In the first phase there were included 24 different materials, but during a process was noticed that one material group including three materials, have to be excluded from this study. The reason was that these three materials have to be investigate separately as there were found synergy benefits with another division. During material categorization was identified that these materials belonged to the bottle neck product group. There were not many suppliers available for these three materials and it was difficult to find alternatives for these materials (Kraljic, 1983). In this study is still left 21 different materials or stock keeping units, SKUs.

The specifications for current materials were gained from company's EPR-system's master data and from current suppliers. The information about specifications are specified as quality specifications which include technical norms and standards (van Weele, 2003). Specifications include the material specifications, like dimensions, the raw material of the product, end usage and other required information. From company's ERP-system was gathered and calculated the information about current delivery batch sizes. This kind of information belongs to the logistics information (van Weele, 2003). Based on the existing information was calculated the new requested batch sizes for each material, and these amounts were used in the tenders. For the tenders the case company's legislative requirements, like code of conducts, were defined. This information is categorized as legal requirement (van Weele,

2003). The specifications should be qualified precisely that the information is valid for the next phases of sourcing process.

In the next phase the possible suppliers for tenders were identified. In the tender some of the current suppliers but also new suppliers were included. With tenders the aim was to gather wide market information about the price levels, about the supplier's capabilities against the material lead times and about the abilities to work with vendor managed inventory. The case company is not currently working with vendor managed inventory. Current suppliers were found from company's ERP system. The new suppliers were found from exhibitions, from internet and from the suggestion of colleagues. Iloranta and Pajunen-Muhonen (2015) have suggested these ways to source new suppliers. After the identification to the tenders 10 current suppliers and six new suppliers were invited.

The next step was to send out the tenders. The tenders were released through online tender system. The routine materials were divided into three different tenders, based on the material characteristics. Suppliers had two week time to place their answers on the tender. They were asked to offer the prices for two different batch sizes per each material for current specification, for alternative specification and for more sustainable alternative. Suppliers were asked to offer the prices based on the one month and two-month requirement of the case company. In addition to the requested delivery batch size, suppliers were asked to inform the suitable delivery batch size for them. Suppliers were asked to inform their possibilities to work with vendor managed inventory. Suppliers had possibility to offer only the materials they are able to deliver. Suppliers had possibility to ask further questions if something was unclear. This kind of electronic, online survey is efficient way to gather market information widely from different participants. The case company has been using this kind of method for a while.

After the tenders were finalized it was possible to start the analyzation of the results. Analyzation phase includes the settlement of different suggestions for the case com-

pany. Because the aim is provide the suggestions for the case company, the sourcing project is continuing internally in the case company, and the final decision is not the part of this thesis.

4.5 Suggestions to harmonize the routine material category

In this section the suggestions for the case company are given to how they can reach more harmonized and optimized ways to purchase and warehouse routine materials. The standardization of purchasing procedures can lead to cost savings in the company (Sanches-Rodrigues, Hemsworth, Martinez-Lorente & Clavel, 2006). The straight reductions on the purchasing price might not be the only solution to reach out the cost savings. Many other aspects should be included in the review. The suggestions in this study are based on previously analysed interviews and tenders which were held for different suppliers. Each suggestion includes analysation about transactional changes. Each suggestion is presented in the own chapter and the benefits of each are involved in there.

4.5.1 Suggestion 1: Choosing the cheapest solution

The first suggestion is to choose the suppliers who offered the lowest prices. The prices are based on the tender results. Suppliers offered the materials based on the given amounts in tender. If the case company would choose this option, then they have left 9 different suppliers. This means that the amount of suppliers stays as same as before therefore the reductions in supply base are not reached. It can be assumed that the transactions between suppliers and case company do not decrease.

If the main target would have been to get the cost reductions, in this solution those are not the highest. Because the idea of this thesis is to give an insight into the different options to how the case company can improve their management of routine materials, the possible price reductions have to be stated. If company would choose this option, they would reach costs reductions of 25 percent compared to current

situation. The price reductions can be really high, and in that field there can be found improvements.

From the sourcing point of view by choosing this option the new contracts for 17 different materials should be written and for four materials can stay the current suppliers. In this situation four current suppliers are retained, and five new suppliers should be implemented in the supply base. As mentioned above, the total supplier amount would be nine. If this option is chosen, sourcing should start negotiations with selected suppliers and this causes a lot of work. That is not beneficial because transactional reductions are not met. Buyer should start the negotiations from the beginning with five new suppliers. As stated in the interviews, this suggestion requires material tests for 17 different materials, until the final decisions can be done.

Previously was highlighted that the transactions between case company and suppliers do not decrease in this option. In practice, this means that the case company receives almost as many deliveries as before. The pooling of deliveries from different suppliers is not possible. In this suggestion, there would be five suppliers who deliver only one material and two suppliers who deliver two materials, one supplier for four materials and one suppliers for eight materials. From the transactional perspective opportunities to pool the material deliveries are limited in this suggestion. When supplier is able to deliver more than one material it is possible to pool those materials on the same purchase orders and on the same deliveries. If each supplier would deliver the required materials once per month, then the amount of deliveries would be 108, on a yearly level. This means that no huge reductions are achieved. Either the amount of invoices per year is not going to decrease. Because of the fragmented supplier base, there are no possibilities to get efficiency by delivery pooling. The amount of purchase orders could be minimized. Then each supplier would receive combined purchase orders that would include delivery requirements for a half a year at once. Then the amount of purchase orders can be decreased to 18.

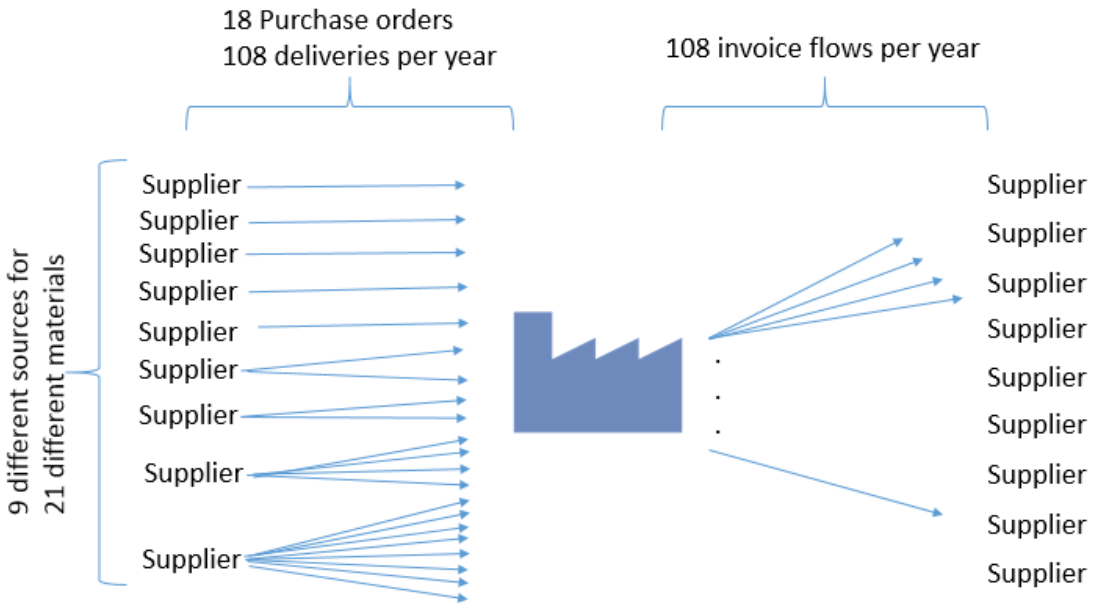


Figure 12. Suggestion 1: Choosing the cheapest solution.

This suggestion gives only the benefits through price reductions. Transactional decrease is not possible to reach because the supplier base stays on the same level.

4.5.2 Suggestion 2: Minimizing the amount of suppliers

In this suggestion the aim is to minimize the amount of suppliers, but not go to the single source option. The suppliers are selected based on the interviews for company's employees and based on the tenders. In this suggestion the suitable suppliers are selected by pooling the materials through material characteristics. The materials which have same kind of characteristics have the same suppliers. The aim is to reach harmonization in that way.

In this suggestion only three suppliers are left in the supply base. This means the reduction of 6 suppliers compared to current situation. The deliveries can be combined in the more efficient way, when the same supplier is able to deliver many different materials at the same time. Supplier A is able to deliver 12 materials, supplier B is able to deliver 5 materials and supplier C is able to deliver 4 different materials. This gives more possibilities to pool the deliveries and more efficiency for stock handling, as the delivery amount can be decreased. The material tests in production for 20 different materials are needed in this situation. The same supplier

stay only for one material when 20 materials have new suppliers. In this situation huge price reductions are reached compared to the current situation. The reached price reductions are 22 percentages.

If looking at the estimated purchase order amount and delivery transactions, it can be assumed that amount of those decrease by selecting this suggestion. If the case company orders the materials monthly and the batch size includes one month's requirements, then the supplier A delivers 12 times per year, supplier B 12 times per year and supplier C 12 times per year, this makes 36 deliveries per year. Currently the case company has received 139 transportations. The amount of transportations decrease radically by 104 transportations per year. If the case company makes the combined purchase orders for supplier A, B and C, the case company receives less invoices if different materials from the same source are delivered together. If two purchase orders per year per each supplier are placed, the annual amount of different purchase orders is 6.

Another benefit that can be achieved by selecting this suggestion is that the value of material stock of routine materials stays steadier. If the deliveries are monthly the variation of stock values is minimized. As the material consumption is quite steady for this kind of standard or routine products, the delivery scheduling is possible. Only three suppliers stay in the supply base, so the case company have more time to improve relationships between these suppliers. This leads into the better communication and improved service.

But now that the advantages are presented some challenges should be raised up also. New suppliers for many materials are suggested and that requires deep negotiations with those suppliers and new agreements should be signed. This takes a working time from a one sourcing person to handle the negotiations and to implement new working ways. Material tests should be done in production, because every time when the aim is to change the supplier for a certain material, it is necessary to test the functionality in production. By material tests the problems are avoided before the implementation. This requires time from production and from new product development function.

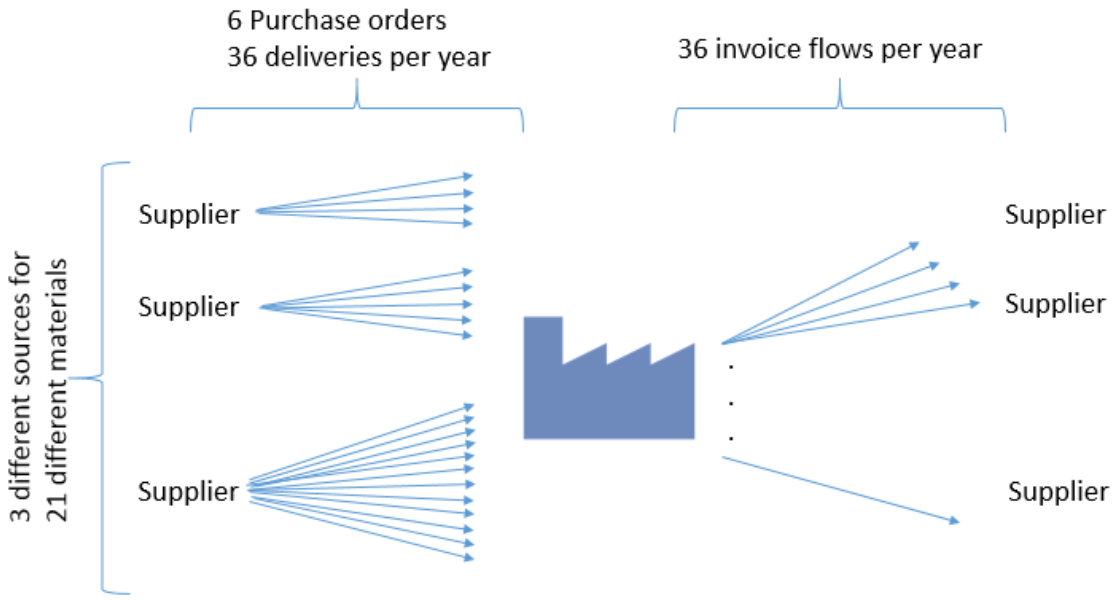


Figure 13. Suggestion 2: Minimizing the amount of suppliers efficiently.

Overall, this suggestion reduces the material costs, transportation requirements, invoice handling transactions, free the time from sourcing function to another tasks, and helps to improve the relationships with the few suppliers and therefore the better service level and delivery accuracy are reached.

4.5.3 Suggestion 3: Single source

The main idea of this suggestion is to purchase only from the one supplier. There was not seen any supplier, who would be straight able to deliver all the routine materials for the case company. This suggestion is based on the estimate to how much work have to be done in advance. There were only a few suppliers who told that they would be able to work with vendor managed inventory. The supplier selected into this review, is another of them.

The price reductions are very low or the reductions are not reached at all. There can be possibilities to reach a bit more price reductions, after the negotiations are started only with this one supplier and the one supplier would receive more power by material pooling. Another problem in this suggestion is that there were two materials that this supplier did not offer at all. This means that there should be started the

negotiations that this selected supplier, would purchase the materials from the suppliers the case company have selected, and act as agent between buyer and seller.

From the transactional point of view the case company would make only two orders per year, with half years requirements for the supplier. Also the deliveries can be combined in very efficient way. If the supplier would deliver the one-month's requirements of each material, the delivery amount per year is only 12. At the same time, the combined invoices can be utilized if the invoicing is done per each delivery from one supplier. Overall, the transactional costs are reduced enormously compared to the current situation. In this suggestion the safety stocks of the case company are reduced because the supplier is responsible to keep materials in their stock for the case company's needs. The supplier is able to deliver on a short notice if the case company faces quality problems or needs the materials unexpectedly. This is a huge benefit, when considering the matter, which was raised up during the interviews, that the case company's own warehouse is too small for current requirements.

This supplier is delivering only three of current materials, this means that it is the new supplier for the 18 different materials. Then the new material tests in production should be carried out for a huge amount of materials. This process is not very quick and it would take for a while, that all the new materials are accepted to the suitable material range. Overall, a lot of work is needed to be done before this suggestion can be implemented and accepted.

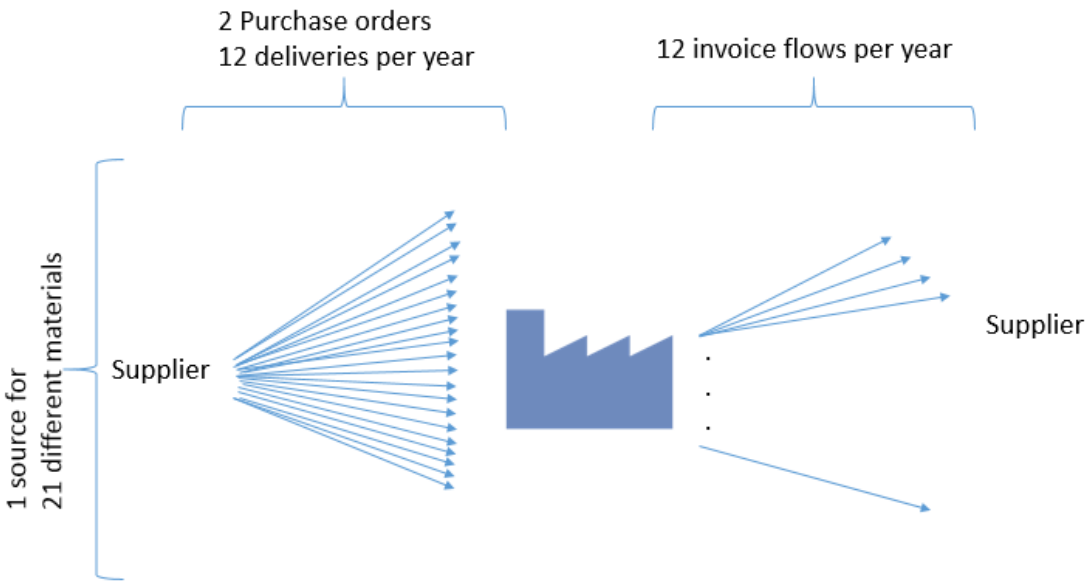


Figure 14. Suggestion 3: Single source.

Overall, this suggestion gives the best opportunities to improve supplier relationships and deeper communication between the parties. The work load before this suggestion can be implemented would be quite high for the sourcing personnel. After the negotiations would have been carried out, the case company has only one supplier, who is able to track the case company's stock situation and secures the material availability in a more efficient way. The inventory level fluctuations can be standardized and material flow is steadier.

5. DISCUSSION AND CONCLUSIONS

The aim of this study was to investigate the ways of how to harmonize and optimize the supplier base and materials flows with routine materials. In this chapter the answers on the research questions are given. After this the validity and reliability of the study are explained. Last part of this chapter is the conclusions, which give the view of the whole study.

5.1 Findings

Each research question is discussed and answered separately. First on the sub-research questions are answered because the aim of sub research questions is to act as a help to find the answer on the main research question. In the last part the answer on main research question is given.

SQ 1: What are the steps of typical sourcing process and how these should be followed in routine product purchasing?

When considering the importance or usefulness of sourcing process, it can be dependent on the situation and sourcing requirements to how well the structured process can be followed. In theoretical part of this study the purchasing process model from van Weele (2014) and pre-order process from Scott et al. (2011) were introduced. Van Weele's purchasing process differentiates the tasks related to the sourcing, purchasing, and procurement. If these two models are combined, the Scott's et al. (2011) pre order process can be seen to be part of the van Weele's (2014) sourcing tasks, including the service of internal customer. Internal customer is a part of the van Weele's purchasing process model, which is not straight included into the sourcing tasks, so it goes with Scott's et al (2011) model, before the start of sourcing it is time to identify the needs and clarify the specifications. After this the sourcing can be started.

When this process is started in the case company, the first step was to identify the need and reasons why this kind of sourcing project should be carried out. It is obvious that the information in tenders have to be accurate, it is necessary to identify the material specifications carefully. Without accurate data, the suppliers are not able to offer correct materials. During the process it was identified that here were actually a few materials that have to be excluded from the whole review. These materials belonged to the bottleneck product category, because of the availability in the markets was not high and there were only a few suppliers who were able to provide those materials (Kraljic, 1983). It is observed that the strict following of a sourcing process can help to identify also risks but to identify pitfalls, which could cause extra work.

This far the sourcing process was strictly followed. It was reminded that the ground work has to be done precisely so the continuum will be easier. After this part the sourcing started with tendering. In the sourcing phase it is recommended to search for alternative suppliers and identify the possibilities of current suppliers. To get the best picture of the market situation it is recommended to include all of the suitable suppliers into the tender. The last step that was possible to follow in this study, was tendering phase. The negotiations are followed after tenders. The negotiation phase was jumped over, and the analysation of suggestions for the case company was done, like in the supplier selection phase. In this analysation was measured the efficiency of different suggestions and supplier capabilities. The negotiation phase would be needed after the analysis and decision between suggestions are done.

It can be seen that the typical sourcing process can act a guideline for sourcing practices. There might be some kind of differences between needs to how the process steps should be reorganised. This does not cause any problems, if the results are desired and company can be happy with the conducted project.

SQ 2: What is the significance of routine materials for the company's production?

It was clearly highlighted in the interviews that the routine materials are important for the company's production. The production can face problems if the materials are

not working properly. In the worst case, the production have to be paused and nothing can be produced without a certain routine material. Production might be forced to do a lot of extra work, if the material is not working as it should. Sometimes there might be requirements to repack end products, which increases the inefficiency. The interviews showed that in addition to the categorization by material importance and supply risks also another aspects have to be included. It is not as straightforward as Kraljic's matrix and ABC-analysis can imply. Heege (1981) and Dubois and Pedersen (2002) have highlighted that to how a portfolio analysis would be able to serve different companies to choose their strategies, just by combining two different dimensions (Geldelman & van Weele, 2005). In these days the business environments are full of complexities and it is difficult to follow only one guideline.

The level of importance of the certain routine material can be measured through quality defects to how much the quality problems might have effect on production run ability or to how much problems the out of stock situation might cause. It might be surprising how much routine materials can have effect in the production of the end product. If we consider the many firm's targets, the goal is to reach the high quality of end products. Gelderman and Semeijn (2006) have stated that high quality of end products in the end product markets, cannot be reached without the ingredients which have a high quality. This means that quality issue should not be forgotten despite of the product importance from the sourcing point of view. The interviewees highlighted that end needs of the customers have be concluded in sourcing decision making. If some of the routine materials would ran out of stock and the end product can be packed despite of that, the customers might notice absence of a certain material. Customer or end users might send notions and reclamations about that. Overall, it is not just about the production and sourcing requirements, the one who set the targets, is the end customer. Based on the results of the this study it is clear that quality is the number one issue which should be taken into account in sourcing, from the productions point of view.

The interviewees highlighted that currently there might be challenges with some of the routine materials suddenly and with some of them problems are not faced at all. There might be a huge variation between different materials but also is evidence of

quality variation inside the one certain material. This is one issue, which is not taken into account in Kraljic's matrix, that despite of non-importance of routine materials, these materials might require certain management from the sourcing personnel in a way that the problems can be minimized.

Company's production employees were worried that while sourcing is aiming to change the suppliers, they are not testing the new materials first in production. Interviewees stated that despite of the unimportance of routine material, the material tests in production are required. By this can be confirmed that new materials will work in production and possibilities to face challenges are minimized. According to purchasing portfolio model, the management efforts against routine materials should be minimized and the time consumed into the routine material managed should not be that much (van Weele, 2018). The interviews showed that actually quality managed is required with routine materials.

It was surprising that the opinion about the importance of the routine materials can be really high from the production's view point. Those kind of surprising results might have an effect on sourcing management ways and sourcing decisions. The recommendation would be that sourcing professionals should definitely utilize internal stakeholders, for example during material categorization and while planning new sourcing strategies. Surprising aspects can be highlighted from the other functions of the company. Apte et al. (2011) have stated that by linking company's supply chain strategy into company's sourcing activities, companies can reach competitive advantage. Sourcing strategies should follow the organizational principles to reach best results.

SQ 3: What strategic issues may have an effect on sourcing decisions and how the case company should consider these during the decision making?

The answering on this research question is possible with previous literature. While conducting the theoretical part of the study, the researcher had to examine previous literature and scientific articles. Based on this research it is shown that still after a many years, the Kraljic's matrix (1983) is the most known and examined sourcing

portfolio model. This matrix categorizes the sourced materials based on supply risk and profit impact (Kraljic, 1983). Many researchers (van Weele, 2018; Caniëls & Gelderman, 2005; Gelderman & van Weele, 2003; Iloranta & Pajunen-Muhonen, 2015; Hesping & Schiele, 2016; Miltenberg & Wijngaard, 1991) have created suitable strategies for the Kraljic's matrix which can be utilized while planning the sourcing strategies in the company. These strategies can act as the guidelines in many different occasions and industries. ABC-analysis is the value based analysation method, which categorizes products based on the SKU amount and spend per SKU (Weigel & Ruecker, 2015). According to the ABC-analysis, the routine materials of this study belong to the C-category because of the low annual value.

Inventory management was raised up as one important aspect, when making the sourcing decisions. According to Chase et al. (2002), the inventory managing costs of purchased materials can arise into the 30-35 percentages of the total costs of purchased materials. Baily et al. (2008) have stated that possible stock reductions and stock value reductions can be achieved by just-in-time deliveries, by optimized order quantities or by ensuring the accurate deliveries by more accurate forecasts (Baily et al., 2008). One way to reduce the inventory and buying administrative costs inside the purchasing company is Vendor managed inventory, VMI which is based on the idea that supplier takes care or the customer's inventory fill ups (Claassen, van Weele, & van Raaij, 2008; Baily et al. 2008). According to Baily et al. (2008), often the products classified into C-category are turned into a vendor managed inventory.

Researchers have identified that supply base management is one the most important aspects to consider in sourcing management. Supplier base reduction has been identified to reach better relations, more efficient processing and better quality for the sourced materials in some occasions (Handfield et al. 2009; Odgen & Carter, 2008; Faes & Matthyssens, 2009). Transaction cost economics suggests to minimize the transaction costs so that the resources can be distributed in to another activities (Carter & Hodgson, 2006 cited in Luzzini et al. 2012). This is important aspect when considering the materials with low value because the transactions can cause higher costs than the actual price of the material is. If the case company

wants to consider the costs very carefully the transaction costs economics can help in that. Now that the most important strategic variants are established, it is time to answer to the main research question.

RQ1: How material flow from supply to production of routine materials can be optimized and harmonized?

The sub research questions were discussed first because the aim of those is to work as supportive elements, while trying to find the answer to the main research question. In this way, the reader can get a view and understanding about the investigated topic. The aim was to figure to how the case company could improve their material flows from the supplier to the company's production. Under this consideration is included sourcing and internal warehousing options. Interviewees highlighted that currently sourcing has not managed the routine materials enough. By conducting the sourcing project for the product category of routine materials more efficient sourcing strategies and better management ways can be reached.

First of all, the results showed that the routine materials require managerial actions from sourcing. Currently the working ways are too inefficient, which can be identified from the case background. For routine materials it is recommended to utilize order volume optimization and transaction costs reduction by utilizing product standardization, by improving material processing and by material inventory optimization (Hesping & Schiele, 2015). In current situation are too many different transactions related to the sourcing of routine materials. This is mostly caused by too wide supply base. Kraljic (1983) have recommended to use a certain strategy for routine materials. Gelderman and van Weele (2005) have pointed up that suitable strategy for routine materials would be to minimize transactions. From the interviews were find out that currently transportation defects for routine materials have caused problems. The supplier management is easier with a fewer suppliers (Odgen & Carter, 2008), when also transportation and deliveries can be managed more carefully.

It was obvious message from the interviews that the interviewees see that currently sourcing is not considering these routine materials as important, as they should.

Previously was mentioned that routine materials can cause many different challenges in the case company's production and the challenges can be noticed by the end customers. The message from interviews was that sourcing should manage routine materials more carefully. Just-in-principles may help to overcome this problem. One of the just-in-time deliverables is better quality, because the purchasing partner trusts on the quality what supplier is delivering – there is mutual trust between both parties (Benton Jr., 2010; Lysons & Farrington, 2016; van Weele, 2018). One evoked concern from interviews was to how to improve quality of routine materials, just-in-time principles give a solution for that. Supplier should take care of the standardized quality and purchaser can trust that the materials are delivered according to the specifications and requirements.

Based on interviews the case company's current warehouse has limited capacity. Because of this just-in-time purchasing should be implemented in to this product category to streamline the material flows. By implementing just-in-time principles into the purchasing on time deliveries with right quantities could be reached in the case company. In this way it is possible to reduce safety stocks, as deliveries from suppliers are based on the actual need. To reach this the deliveries should be based on actual production plans (Gupta & Kini, 1995).

The interviews showed that the case company's current warehouse management is not working properly. Two-bin system is recommended as suitable material handling method for the case company. The benefits of two-bin system are that inventory is placed nearby the actual place where the materials are consumed. This helps to eliminate the inventory transactions between productions and warehouse (Miltenburg & Wijngaard, 1991). It has been estimated that two-bin system can reduce material inventory handling about 50% (Nicol, 2010). By this way the case company can reach their requirements, and production employees do not have to spend too much time to trying to find the needed materials from the warehouse. By implementing two-bin system, the case company is aware about the actual material needs, when a separate trigger to fill up the BINs exists. At the same time should be agreed

the responsibilities in a more clarified way. Some criticism is stated against the current inventory management ways as the information flow between people in charge and users does not flow very efficiently.

For leverage items is normally recommended to utilize tendering and establishment strategic partnerships (Gelderman & van Weele, 2003; Caniëls & Gelderman, 2005). Currently the supply base for routine materials is based on deliveries from nine different suppliers. Tenders can be utilized to get the market overlook and find possibilities to reduce supplier base for the routine materials. The sourcing strategies have to be mixed to find the most efficient ways to source the materials. In this harmonization and optimization process the recommended strategy for leverage items should be utilized in routine material purchasing. The case company's need is to straightforward it's material flows, it is easy to do by building strategic partnerships only with a few suppliers, than with a wide supply base. By supplier base reduction desired benefits in the case company can be reached. The benefits of supplier base reduction are capacity improvements, more flexibility, lower inventory levels, quality improvements, transportation cost reduction and improved operative management and better relationships with suppliers (Odgen & Carter, 2008; Faes & Matthyssens, 2009)

In the following table is presented the comparison of the different suggestions for the case company. In the table is included the current situation. As can be seen, the suggestion 3 is the most efficient what comes to the amount of transactions. With suggestion 1 it is possible to get quite close to that, but with suggestion 1, the price reductions would be much higher. In suggestion 2 would be two suppliers who would be able to turn into vendor managed inventory. The suggestion 1 seems to be the inefficient because of the huge amount of transactions. Between suggestion 1 and 2 is not high difference in price reduction, but transactions are decreased a lot in suggestion 2 compared to suggestion 1.

Table 3. Comparison of sourcing suggestions.

	Current situation	Suggestion 1	Suggestion 2	Suggestion 3
Amount of suppliers	9	9	3	1
Amount of deliveries	139	108	36	12
Amount of invoices	139	108	36	12
Amount of POs	99	18	6	2
Price reductions	-	-25 %	-22 %	0%-2%
Capabiltities to VMI	-	2 of 9 suppliers	2 of 3 suppliers	1 of 1 supplier
New materials per supplier Tests for new materials needed	-	17	20	18
Current materials per supplier No material tests needed	-	4	1	3

When considering the strategic issues and problems highlighted in interviews, it would be recommended to decide between suggestion 2 or 3. In above table, the transaction amount were evaluated based on the monthly deliveries. If the company would follow the recommended just-in-time principles, they should increase the delivery amount at least double, that the deliveries would be twice amount, every two week. If the case company would be able to negotiate the agreement only with the one supplier the implementation of just-in-time principles would be the easiest to do. Then the delivery amount per year would increase only to the 24 times. With suggestion two, in the case of three suppliers, the delivery amount would maximally be 72 deliveries per year, which is also much less than in current situation or than in suggestion 1. The transactional costs can be reduced efficiently in both suggestions, 2 and 3, when resources can be distributed in other activities (Carter & Hodgson, 2006 cited in Luzzini et al. 2012). TCE and TCO are quite detailed tools to manage the sourcing categories and in this case the utilization of those is not efficient. Other strategic issues can fit better in this situation.

Efficient processing, product standardization and inventory optimization are seen as suitable strategies for non-critical products, according to the matrix of Kraljic (Caniëls & Gelderman, 2005). These strategies could be implemented for the case company. In addition to this the supplier base reduction and just-in-time principles can be implemented. As can be showed the sourcing strategies recommended for different product categories can need mixing in a certain situation. It is not as straightforward in the real business world. As Gelderman and van Weele (2002)

have stated the complex business world evokes a need to make unique sourcing strategies.

5.2 Validity and reliability of the study

According to Stuart et al. (2002), concern against validity of the case can be related to construct validity or internal validity. Construct validity describes the level to how it is established correct operational measures against the concepts that are under investigation (Kidder & Judd, 1986 cited in Stuart et al. 2002). The internal validity explains the level how the causal relationships under certain conditions are seen to lead the order conditions (Cook and Campbell, 1979; Yin, 1989 cited in Stuart et al. 2002). In this study was investigated only the one case company. By multiple case study it would have been possible to get more generalized theory of the studied issue, because the analysation would have been happened by comparing the different cases against each other (Eisenhardt & Graebner, 2007). This study comply only a one case and this could have effect on the validity of the study. The validity can be increased by using several data during the case study (Sturat et al. 2002). In this study the situation from the multiple different perspectives was investigated, there were used interviews as a guideline to the further investigation. Included in this the previous literature has worked as a help to analyse the case company's current situation. In addition to this was used numeric data from company's ERP system. By this the wide picture of the whole situation related to the studied issue is reached.

Reliability tells in which amount the operations of the study can be repeated in other situation (Stuart et al. 2002). This study is conducted for a certain environment in a certain company. The used analysation method is typical content analysis, and the principles related to it can be utilized in the any case study. If requirement to investigate similar situation in other company has evoked, the research questions can be utilized in any quite similar way. The data which is used is related only to the investigated case company therefore it is generalized to concern only this situation. The interviews were audio-recorded when it was possible to write the interviewee's answers into the written form. This might have effect on the reliability of the study, as

the interviews were held on different language than what is the written language of this study.

Unfortunately there were not available previous critical literature against the optimization or harmonization in the sourcing field. Neither was available studies which were combining the sourcing activities related to the certain material categorization group. Previous studies are done in a wider level, and all of the material groups are under investigation in those studies. This is why in this study is taken into account the researcher's own perceptions and interviews were held for the case company's employees. The lack of previous literature created a limitations.

5.3 Conclusions

For decades, Kraljic's matrix has acted as a leading method to categorize sourced materials and implement the sourcing strategies in the sourcing organizations. In this study was examined the routine materials which are categorized based on the methodology of Kraljic. The aim was that the case company can find new ways to improve their material flow management of routine materials. In this study the suggestions on how it can be possible to implement the best practices just for the case company's needs was given. By the interviews, it was possible to investigate the current situation and current practices in the company's production on how these materials are currently working on machines, and on which kind of problems with these materials have evoked. The case company's production employees have the best knowledge about the material functionality and about the operational perspective.

From the interviews was identified that the routine materials are perceived as more important than the sourcing function identifies them. Interviewees had a perception focused to the more important materials. Routine materials could have a huge impact on the company's overall efficiency. The impact can lead from the internal warehouse handling through the production usage until the end customer. Because of that sourcing should reach new ways to manage these materials. This study shows that sometimes generalized models are not suitable to all occasions and

managerial decisions have to be done based on the company's internal requirements.

Typical sourcing processes can be implemented in the different kind of companies and industries, the usability is more dependent on the current requirements and aims. During this study was identified that typical sourcing processes can act as the guidelines while planning to start the sourcing related projects. The typical process steps can be modified under the certain circumstances to cover up the requirements. The steps of typical process are still mainly valid but order in which the process will be carried out could be changed. Presented process steps can help to identify necessary actions during the project or process.

By conducting this study it was possible to identify inefficiencies in production and in sourcing. By reducing the supplier base and by pooling the deliveries it is possible to reach huge reductions in transactional movements of the routine materials. The time of the purchasers is freed in to the other tasks, when the material flow from ordering to production is managed more efficiently. For example vendor managed inventory can help to decrease ordering time in sourcing function and decrease the warehouse value. The case company should remember that even though it requires managerial implications from sourcing before the benefits are received it would pay the efforts, by more efficient, less transactional, better information sharing and improved quality management.

During the research was identified strategical issues that can assist to optimize and harmonize sourced product categories. In addition to typical sourcing categorization tools, Kraljic's matrix and ACB-analysis, some other strategic issues were raised up from previous literature during this study. Inventory management techniques and just-in-time principles can help to straightforward the material flows and supplier base reduction and transactional reductions can increase the sourcing effectiveness. Overall, the effectiveness of the business can be dependent on the sourcing decisions and to reach the best solutions the sourcing managers should listen the whole company. By this can be found important perspectives on how to organize management.

To conclude, harmonization and optimization of routine materials can perceive many benefits for overall functionality in the company. This study showed that generalized tools might not fit in every situation. Based on the research was conducted suggestions for the case company on how they can improve their routine material management, from supply to production.

5.4 Future research

Future research should investigate more different product categories and criticism against those. Kraljic's matrix is developed in the 1983 and business world has been changed a lot from that. As this research was only concentrated on the one case environment, in the future research the findings of this research should be widened to concern wider business environment. Another recommendation would be that future research should consider to investigate more about the supplier base reduction and transaction reduction benefits in the whole product repertory to how these topics can effect on company's overall efficiency. This research should be conducted for the wider range of companies from different industries.

There could be emerging need to investigate different product categories more deeply. By this should be offered the recommendations of sourcing strategies for modern business environments as most common strategic recommendations are from the beginning of twenty century from Caniëls and Gelderman (2005) and Gelderman and van Weele (2003). In the future research should be emphasized and investigated another functions from the companies, in addition to production and sourcing. Generally the sourcing decisions are investigated from the sourcing point of view, but another functions in the companies may offer different perspectives to wider the understanding of the effects of sourcing decisions.

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APPENDICES

Interview questions:

1. In which organizational function you are working currently? (Production/warehousing/sourcing/other?)
2. How you would describe the importance of routine materials* for company's production?
3. How you would describe the quality of current routine materials?
4. Is there any evidence of any kind of problems with current routine materials (quality/processing/something else)? If yes, what kind of?
5. If there is evidence of problems, what that kind of problems those will cause for company's production?
6. What is your opinion about current delivery batch sizes and delivery cycles for routine materials?
7. How you would describe the current internal material flow and warehousing for routine materials?
8. Would you like to make changes into the warehousing system or way of working within routine materials? If yes, what kind of changes?
9. What you think about current supplier selections?
10. What kind of supplier selection criteria you would prefer?
    a. Quality, price, delivery accuracy, service, reliability, location, technological capabilities, something else?
11. What optimization and harmonization of routine materials brings to your mind?
12. Should sourcing manage routine materials more carefully?
13. What kind of feedback would you like to give for sourcing?

*Routine materials were explained for interviewees separately.