

Standardizing purchasing processes

Increasing purchasing efficiency for production
process equipment at Höganäs Sweden AB



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Maria Ek

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Master thesis in Industrial Engineering and Management (I08)

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Executive summary

- Title:** Standardizing purchasing processes – Increasing purchasing efficiency for production process equipment at Höganäs Sweden AB
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- Problem discussion:** The execution of the purchasing process of production process equipment at Höganäs Sweden AB is believed to have an improvement potential. Increasing its efficiency and securing the quality of the purchasing process is therefore of large interest from the company's point of view. The process' completing is highly dependent on the experience and knowledge possessed by the persons that are connected to the purchases of production equipment items. The insecurity of the procedures and the possibilities of making mistakes are hence the main issues of concern.
- Purpose, objectives:** The main purpose of this study is to standardize Höganäs' purchasing process of production process equipment to reach a better purchasing efficiency. The objective of the standardization is partly to ensure that purchasing is done in a consistent and good way. Partly it should also ensure that everybody involved in the process know what has been done, that this has been done correctly, and know what there is left to do.
- Method:** The methodology of the research builds upon the constructive approach, which is an approach suitable for defining a problem and constructing a solution to it that improve a prevailing system, process and performance. The idea of the solution has been constructed by the means of a single-case study wherein interviews has been the main source of information.
- Conclusions:** It has been concluded that the case company has many efficiency improvement potentials if a process standardization of the purchasing process of production process equipment is implemented. Suggestions for what the standardized processes can look like with strategic implications from a portfolio model are provided, together with benefits explicitly connected to those.
- Keywords:** Purchasing process, process standardization, purchasing portfolio models, purchasing efficiency, Höganäs, production process equipment

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Preface

This master thesis is the final step in reaching my degree of Master of Science in Industrial Engineering and Management. Finalizing it therefore represent not only the half-year of work embedded in this report, but my complete education at LTH, the Faculty of Engineering at Lund University. For that reason it is with both great relief and pride I hereby present this work, which possibility I for certain know is due to the different kinds of support that I have received from family, friends and university friends.

Conducting the master thesis has given me deepened knowledge in the included theoretical areas, but above all it has been a valuable experience and has given me an appreciated insight into the practical work of an interesting company. I would therefore like to take the opportunity to thank Höganäs for the reception I have encountered and for the seriousness in which my work has been treated. This means for instance an understanding of the academic requirements of a work like this, as opposed to the sole interest in the gain for the company.

All the persons at Höganäs who have committed time to provide me and this study with information, and thereby made it possible, have my warm gratefulness. Among these people, I would like to express a special thanks to Per Westman who has been my company supervisor and helped me in big and small.

My appreciation should also be directed towards my supervisor and mainstay at LTH, Ala Pazirandeh, who has provided me with valuable help and guidance. She has also gone through many versions of my chapters, with an unfailing willingness to make this report as good as possible.

Last, but certainly not least, I want to mention and thank my father Sven and my friend Lina who have spent hours on reading this report to help me improving it, and with no other reason than kindness.

Lund, 2013-01-14



Maria Ek

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1. Introduction

This chapter introduces the reader to the underlying problem, revealed at the case company, which has formed this project. A short theoretical background is given, which is aimed at introducing the reader to the theoretical topics that are discussed and used in the analysis and in getting to a proper solution to the problem. The purpose of the study is stated and then specified by research questions and objectives. The delimitations and the overall structure of the report are also described.

1.1. Höganäs Sweden AB and the research problem

Höganäs AB is a Swedish company with international presence and with metal powder technology and its applications as the main competence and activity (Höganäs AB, 2012d). Today, the purchasing of production process equipment at Höganäs Sweden AB¹ is not perceived satisfactory says the supply chain manager, Molin, and the engineering manager, Westman, at the company (Molin & Westman, 2012). The dissatisfaction relates above all to quality and efficiency of the purchasing process. The quality has to do with the importance of connecting the right documents and requirements to each purchase while the efficiency is connected to the actual execution of purchases (*ibid.*). Many steps that are included in the purchasing procedure need some kind of experience and specific technical knowledge in either the actual item that should be purchased or in the company specific requirements (*ibid.*).

The way purchasing is performed today is not sustainable for the long term and holds only as long as the required knowledge and experience is possessed by the one who conducts the purchase. This implies that the company uses an unstructured approach for the purchasing of production process equipment that requires experience and skills, and where mistakes are too easy to make. (Molin & Westman, 2012)

1.2. Theoretical background

As purchasing gets a more central role within companies, the objectives of this function are more and more connected to the companies' overall objectives. Those can, for instance, relate to cost-reductions, increasing the quality of products or reducing lead times. Based on such objectives, purchasing management can choose to focus on different areas for action and adopt different strategies. (van Weele, 2010)

Efficiency and effectiveness are central concepts in creating a competitive value chain (Thompson, 1996; Degraeve & Roodhooft, 1997), and as the purchasing activities get a more central role, which is emphasized by Trent and Monczka (1998) a better efficiency and effectiveness is assumed to be desirable also in connection with the purchasing process. It is common to express effectiveness as 'doing the right thing' and efficiency as 'doing things right' (Kakwezi & Nyeko, 2010). However, an explanation of what effectiveness is, stated by van Weele (2010, p. 305), is that it is the extent to which "a previously established goal or standard is being met", meaning "the relationship between actual and planned performance of any human activity". Efficiency, on the other hand is defined by the same researcher as "the relationship between planned and actual sacrifices made in order to

¹ Henceforth, "Höganäs" will be the denomination of the company in focus if nothing else is stated.

realize a goal previously agreed upon” (van Weele, 2010, p. 305). The efficiency thus relates to the required resources, i.e. costs, to reach objectives (*ibid.*). This project deals with finding good procedures of undertaking purchasing, procedures that should help the company exploit its resources in a better way, therefore, what is most interesting in this case is the purchasing efficiency.

Standardizing processes has been shown to result in improved efficiency, which in turn can be a part of improving the process performance (Beimborn et al, 2009; Schäfermeyer and Rosenkranz, 2011; Münstermann et al, 2010; Sánchez-Rodríguez et al, 2006). Sánchez-Rodríguez et al (2006, p. 57) defines standardizing purchasing processes as to “*pre-set procedures and reference material for performing normal daily purchasing tasks such as ordering, expediting, selection of suppliers, and receipt and inspection of goods*”. This research will focus on stating procedures in this meaning, which by some may be called structuring. Hence, standardization will be mentioned in the sense of arranging for instance activities, procedures and processes in an orderly way; a way that is repeatable and in before-hand documentable.

Research within the topic of purchasing and supply chain management has for a long time focused on contractual relationships, data interchange and vertical integration, efficient consumer response, investments in emerging economies, organizational behavior, and risk management to mention a few (Chicksand, 2012). Previous research on purchasing process standardization connected to companies’ performance seems to be very limited. One explicit example is a study made by Sánchez-Rodríguez et al in 2006. This study empirically examined the impact of standardization on purchasing and business performance.

With the increasing importance of both value creation and the inter-organizational networks that should create the value, processes become more complex as they range over different functions and their boundaries. With increased complexity of processes, the standardization of them also becomes more multifaceted with difficulties in establishing rules and procedures, which in turn makes standardization even more important. Accordingly, the research interest in process standardization and its performance outcomes increases and gradually becomes more central. (Schäfermeyer and Rosenkranz, 2011)

1.3. This research

1.3.1. Purpose

Due to the complete reliance on individuals’ experience and in the extension of this the lack of consistency in the way the purchasing process is completed, there is a large potential for improving the efficiency within the purchasing of production process equipment at Höganäs. Thus;

The main purpose of this study is to standardize Höganäs’ purchasing process of production process equipment to reach a better purchasing efficiency.

1.3.2. Research questions

The overall objective of this project is to create a standardized purchasing process of the production process equipment at Höganäs. With this at hand it should be more difficult to make mistakes throughout the process and one should also know that what is done, when it is done, is correct.

Accordingly, it is also important to figure out what is done in a good way and where improvement is advantageous in today's purchasing process at Höganäs. The question is then how this good way of completing the purchases can be established as *the* way to do it, or formulated as the first research question:

RQ1: What can a standardized purchasing process look like, with the example of Höganäs Sweden AB?

This study is a part of the company's aim to continuously improve the efficiency, both in time and costs. The efficiency can for instance be improved by the study through its aim to shorten the time it takes to complete a purchase (i.e. the internal purchasing lead time), owing to the standardization of the purchasing process. This relationship has been pointed out by e.g. Schäfermeyer and Rosenkranz, (2011). This would as well decrease costs when the saved time can be used for other, more complex, matters. Due to the orderliness a standardized process can bring, it is less likely to make both costly and disturbing errors, so to get rid of any such errors would result in a higher efficiency and lower costs for corrections, which has been emphasized by Beimborn et al, (2009). With structure also comes the fact that more people can understand the process, and be able to accomplish a purchase or take part in any step and still know what is going on (Münstermann et al, 2010). This is good both for the understanding of the process and for the fact that the process itself is not dependent on a few people. All those possible improvement areas lead to the second research question:

RQ2: What benefits and efficiency improvements can a standardized purchasing process bring, specifically in the case of Höganäs Sweden AB?

To be able to match the company's needs, it is requested from the case company that the standardized processes should ensure that all internal buyers know what is expected of them in the purchasing process and that the purchaser can execute the ordering in a consistent way. Information that once has been put into the system should be available in the next step of the process. The system should work as a pathfinder where all rules and need-to-know information for production process equipment purchases can be found.

When it is stated that "everyone" should be able to conduct a purchase with the expected solution on hand, the meaning is everyone who is in a position that justifies that a purchase could be in question to conduct. However, this does not prevent the possibility for each and every one to understand the process or procedure, and how far a certain purchase has come in the process at any time.

1.4. Delimitations

1.4.1. The purchasing process

The study and the solution should cover the whole purchasing process, from the step where a need arises to when the item is actually delivered at the right place. It is important to cover the whole process in the initial approach of the problem since the holistic view is preferred and is seen as an advantage. One delimitation connected to the purchasing process, however, is that any reverse logistics and the handling of returns will not be considered. Including those parts will not make the solution better or more complete, but only enlarge the area examined.

1.4.2. Items in focus

From the company's point of view, this project concerns *technical purchases* which is an internal concept. As stated by the Engineering Manager at Höganäs, the common attribute for all those items is that they belong to any production process equipment, whether small or large, expensive or not. The delimitation here is thus that the study only covers production process equipment, and in this report the abbreviation PPE, by itself or in combination as in PPE items, will be used for the items in focus.

Together with production equipment, buying services are sometimes needed (i.e. mounting or installation). However, the process of purchasing services is not considered since this process differs too much from the purchasing of items process. It has been shown (e.g. by Smeltzer and Ogden (2002)) that purchasing professionals see differences between the two processes of purchasing materials and purchasing services. Hence, they should not be treated in the same way and need different training, performance evaluation systems, and so forth (Smeltzer & Ogden, 2002).

1.4.3. Geographical company focus

Geographically, the project only covers the activities taking place at the Höganäs city² location. Interviews and collection of information will take place there and are hence snapshots of the situation at this location. But since Höganäs AB both has other sites in Sweden and an international presence, the overall results should in largest possible extent be made to be applicable on other sites.

1.5. The structure of the report

This introductory chapter describes the background of the subject, the study and the problem, and as *Figure 1* shows, the next chapter presents the company. This chapter is separated from the empirical part since it is not used within the analysis and since the information provided is in overall terms to give the interested reader an insight to the parent company and the industry that Höganäs is operating in. The methodology for the study used is explained in chapter 3 as well as its ingoing parts. The literature study in chapter 4 gives descriptions of theory relevant for the research topic and for the understanding of the analysis and conclusions. Chapter 5 provides descriptions of purchasing at the case company. This leads to more elaborations and discussions, which take place in chapter 6 and 7, analysis and discussion. Suggestions are provided in chapter 8 and the conclusions in chapter 9 points out the important findings and rounds off the study.

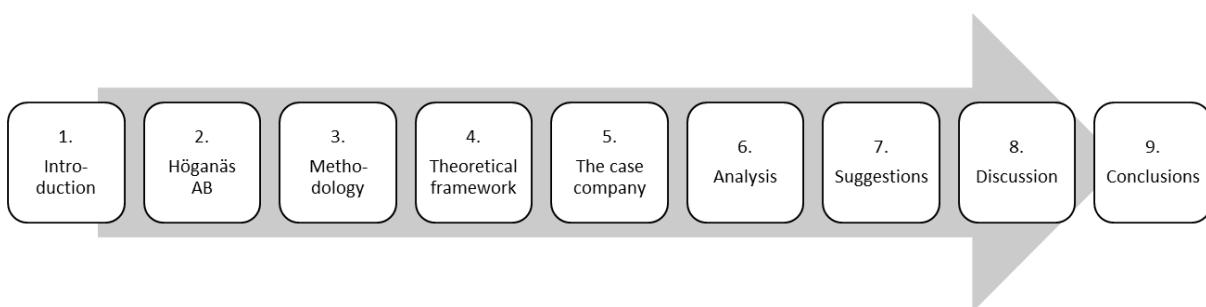


Figure 1. The report structure

² *Höganäs* is, apart from the name of the company, also the name of the city where headquarters are located (or vice versa).

2. Höganäs AB

This chapter introduces the parent company, Höganäs AB, to the reader and describes it in terms of what is produced, what market it is acting on, its customers, and some thoughts about the future in the industry. The chapter also provides an illustration of the organizational matters of the company and specifically where Höganäs Sweden AB and its purchasing function is located. Lastly, some managerial statements regarding the purchasing function are provided.

2.1. Operations

2.1.1. The company and its products

Höganäs AB is today a world-leading producer of metal powder (Höganäs AB, 2012a). Its origins were established over 200 years ago but the company was then focused on coal mining, bricks and pottery (Höganäs AB, 2012b). Today the company is solely focused on metal powders and the path towards this started in 1910 by the introduction of the Höganäs Sponge Iron Process (*ibid.*).

The company's turnover for the year of 2011 was around 7 billion Swedish kronor, the total volume of powder sold was approximately 475 000 metric tons, and the number of employees worldwide was nearly 1 700. The company's stocks are traded at NASDAQ OMX Stockholm's Mid Cap list and the company is included in the index of Metals and Mining within the Material sector. The three largest owners in monetary terms are Lindéngruppen AB, AB Industrivärden and Didner & Gerge Fonder AB with a total of 56 percent of the votes and 44 percent of the capital. (Höganäs AB, 2012a)

Using metal powder when producing any components is advantageous in many ways; it is possible to produce quite complex geometries and there is little or no need for any post-processing (Höganäs AB, 2012a). This reduces waste and the throughput is faster compared to non-powder production (*ibid.*). A drawback, however, is that larger batches is required to justify the cost for the process equipment for producing the components (Liljegren, 2012a).

Höganäs AB has two separate business areas named Components and Consumables, which in fact also could be called the company's way to roughly segment the market. Components include all the metal powder that is further processed at the customers' site into components. The manufacturers of the components compress and sinter the metal powder into components that then are sold to product- or system manufacturers or original equipment manufacturers (OEMs). Sub-market segments for the Components are powder metallurgy components and soft-magnetic components, and applications of those are synchronizing-hubs in manual gear boxes, cogwheels in electric hand tools, and stator components in electric engines. Consumables include metal powder that is sold to be used in industrial processes. Examples that this powder is used for (which is also sub-segments) is surface coating, friction materials, welding rods, solder pastes, water purification and food and fodder fortification. (Höganäs AB, 2012a)

Metal powder is manufactured mainly by two different methods. By using *reduction* or the *Höganäs process* iron ore is reduced to pure iron, which is a porous iron and is called sponge iron. When using *atomization* molten metal flows through a nozzle and is exposed to a fluid flow (water or gas) of high velocity. Then the molten metal droplets solidify into powder particles. The powder is also strained

various times to obtain the different particle sizes needed for different applications. (Höganäs AB, 2012c)

2.1.2. Markets and customers

The group of Components customers constitutes three quarters of the sales and those customers are subcontractors of finished products or OEMs. The Consumables consequently stands for one quarter of the sales and this is mostly to OEMs. (Höganäs AB, 2012a)

Höganäs AB has no intention to compete with their customers by producing any components themselves. However, in the area of so-called soft-magnetic powders some steps have been taken away from this. The company produces finished inductors that are used in inverters, which transform DC (direct current) to AC (alternating current) in for example sun or wind power generators or in electrical engines. (Liljegren, 2012a; Höganäs AB, 2012a)

About 60 percent of the total sales come from the automotive industry (Liljegren, 2012b). Höganäs AB holds 35 percent of the world market for iron- and metal powder and is therefore market leaders in the industry and the market share in Europe is over 50 percent (Liljegren, 2012a).

Over 99 percent of the sales are located outside Sweden (Höganäs AB, 2012a); Höganäs AB is therefore one of Sweden's most international companies (Liljegren, 2012a). It is the only metal powder producer in the world that has this kind of global coverage (*ibid.*). Approximately 35 percent of the sales come from Asia, a little more than 30 percent from Europe and the same from the Americas, which is illustrated in *Figure 2* (Höganäs AB, 2012a). Höganäs AB is not present in Africa but this is seen as an emerging market with great potential in the future, as is the continuing growth in Asia (Liljegren, 2012a).

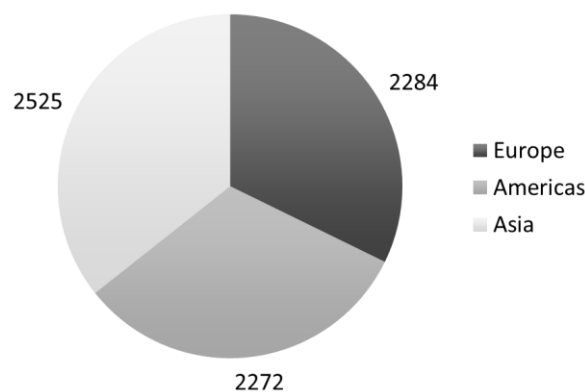


Figure 2. Sales in million SEK per region for Höganäs AB (Source: Höganäs AB, 2012a)

2.1.3. Future growth

The metal powder market is growing and Höganäs AB's goal is to grow with six to eight percent in average per year. Apart from doing this in new markets the company is also dependent on that it, and its customers, find new application areas, either totally new ones or by finding new uses for current ones. New applications imply that the metal powder industry is growing faster than the overall industrial production and Höganäs AB is said to grow even a little bit faster. (Liljegren, 2012a)

To exemplify this, Liljegren (2012a) states that the total yearly market for electric engines (everywhere, not only in cars) corresponds to one to 1.2 million metric tons of metal powder, and this is the double amount that Höganäs AB produces in total today. An average car contains eight to ten kilograms metal powder (a SUV around 25-30) and over time the use of metal powder has increased in all types of cars (Liljegren, 2012b). According to the latest annual report from Höganäs AB there will be 100 million cars produced each year from the year of 2020. Each of them will require cogwheel transmissions and “*only the cogwheels in those cars will have a total market value that corresponds to the whole market for PM-components [powder metallurgy components] today*” (Höganäs AB, 2012a, p. 5).

2.2. International and regional organization

The organization charts below, *Figure 3* and *Figure 4*, are provided to give the reader a glimpse of the organization of Höganäs AB. The European region is marked in the international organization chart and in the chart over the European region the two main functions of interest for this study is marked; Purchasing and Engineering & Process Improvement (the technical department).

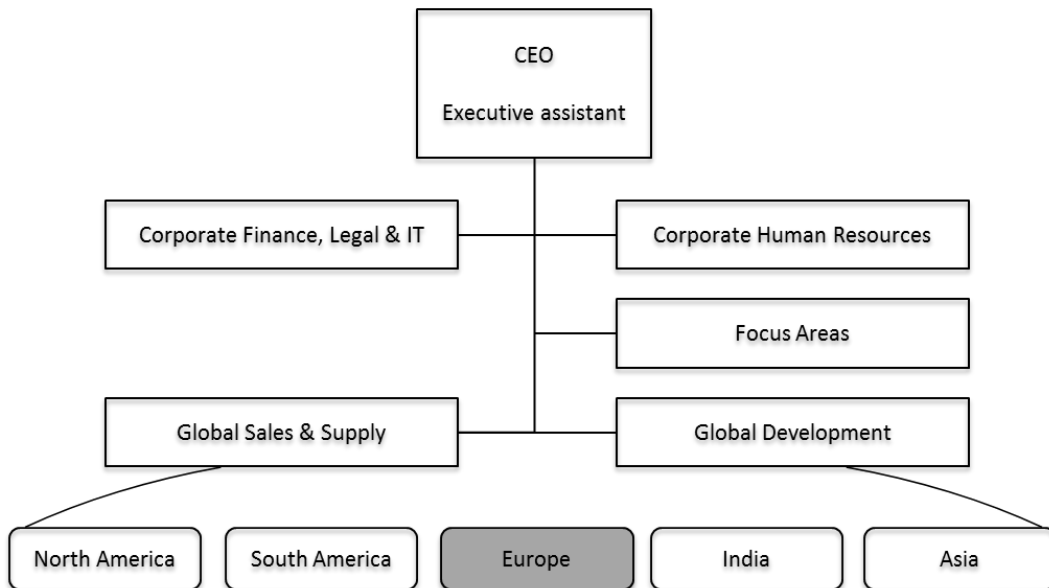


Figure 3. International organization at Höganäs AB (Source: case company internal)

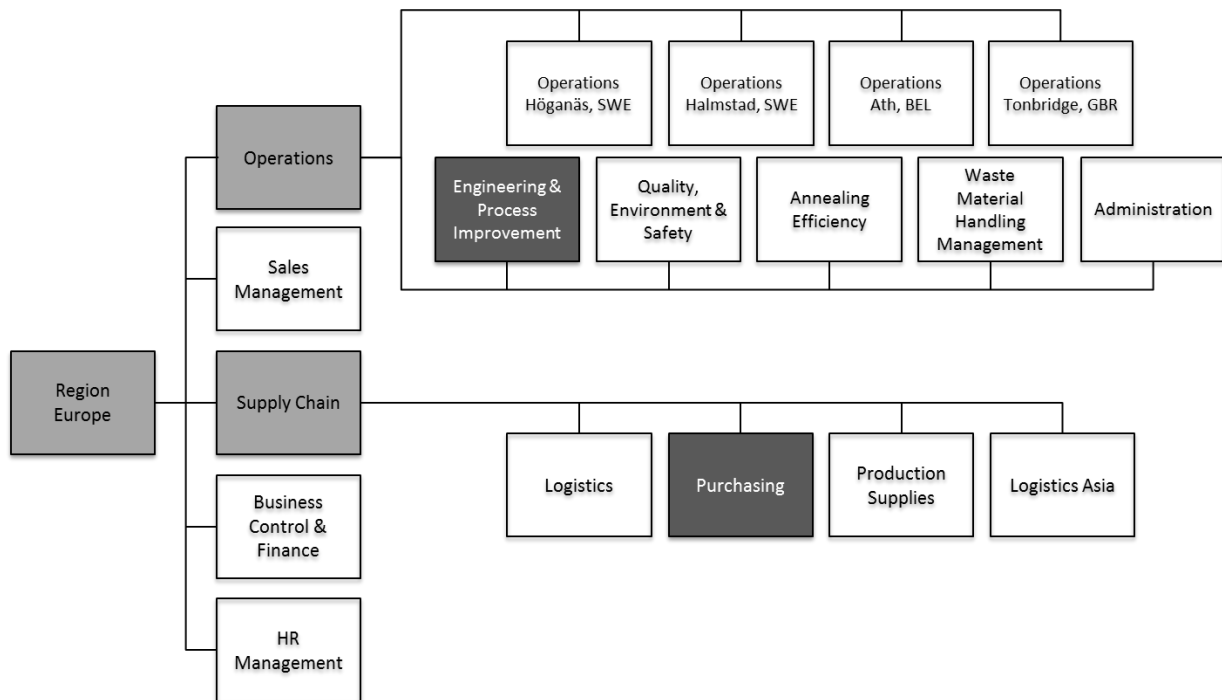


Figure 4. Regional organization at Höganäs Sweden AB (Source: case company internal)

2.3. Höganäs AB's purchasing profile

Höganäs AB has, just like any other company of its size, management systems at different levels. The ones concerning the Höganäs city site are the same guidelines and requirements as for Europe and Sweden. The parent system regulates the general descriptions of purchasing as well as purchasing guidelines. By following the description of how purchasing should be done, the company should “ensure that purchased products and services are in line with expectations from Höganäs AB in terms of quality and environment”. It also states that suppliers are handled differently in accordance with the effect their products have on the company's end product. At the European level it is also stated that the purchasing function should contribute to the competitiveness and the profitability in line with the company business concept. (Management System, 2011a)

One purchasing description paragraph states that evaluations of suppliers of indirect material is done for groups of suppliers, and this should be done by the responsible strategic purchaser. For direct material suppliers are evaluated on a yearly basis and this is thoroughly described in a separate management document. (Management System, 2011a)

In relation to indirect material it is stated that purchasing should only consider suppliers who “appear to have the best systems in place in terms of quality and environment”. It is also said that:

- The purchasing function is responsible for commercial and legal parts of the purchasing process,
- Goods that has a strategic importance for the company in total should be handled, i.e. coordinated by global purchasing teams,
- And for such goods operations within purchasing and supplier choices should also be based on “good knowledge of the world market”, and “good and long-term cooperation with suppliers

shall be focused if justified by the supplier's competitiveness and reliability regarding quality and performance",

- The lowest total cost, including purchasing price, quality, delivery performance, payment terms and capital tied-up, should be guiding,
- *"In all Purchasing work within the Höganäs Group, on global as well as local basis, the benefit of the Group in total shall always be the highest priority",*
- The company should "strive at having the best possible supply chain partners and work for long term development together with suppliers for mutual long-term benefits, and
- Solutions should be found that have the lowest possible impact on environment in terms of products, services and transports.

(Management System, 2011b)

The view the company has today on purchasing is that a process is either for direct or indirect material, and is either strategic or operational. Hence, no specific guidelines, management documents or process maps exist for the production equipment purchases, but since the things outpointed above holds for the whole company group, or at least the European region, they should also be followed regarding the purchasing process of production process equipment. (Management System, 2011a)

3. Methodology

This chapter begins by pointing out the research characteristics of this study, which together have led to the choice of the overall methodology, as in the constructive approach, as well as specific methods for conducting the study. Within the constructive approach a comprehensive literature study has been done for both the understanding of the topic and the ability to create a proper solution. In the construction of the solution the single-case study is an important method, which is described through its ingoing components. The chapter ends with a section describing how the quality and trustworthiness of the study have been ensured.

3.1. Research approach

3.1.1. Research strategy: Quantitative or qualitative

The characteristics of the research topic and the objectives of the research described in the introductory chapter are related to human explanations, descriptions and abstract reasoning, as opposed to numbers and large data files. This implies that the methods of information gathering will focus on interviews, observations and documents with descriptions, not figures, which leads one to believe that a *qualitative research* method and information gathering is appropriate since this is one characteristic described by Denscombe (2009).

In the same sense, qualitative research would mean that the research have words and images as the central analytical unit, while quantitative research have numbers as the central unit (Denscombe, 2009). Another distinction is that qualitative research tends to be connected to descriptions and the quantitative with statistical analysis. A third difference, which is important for this project, is that qualitative research tends to have a holistic focus while quantitative has a more specific focus (Denscombe, 2009). This means that the qualitative research “*study things in their context and points out how they are linked and dependent on each other – instead of isolating variables and focus on specific factors*” [translated] (Denscombe, 2009, p. 322). These distinctions do however not claim that qualitative and quantitative research is mutually exclusive, but since this study will put processes, people’s actions and strategies in focus and not encompass any large statistical surveys, the research basis will be qualitative.

3.1.2. Principal role of theory in relation to research: Deductive or inductive

The concepts of deductive and inductive research approaches deal with whether theory is tested or constructed. Deduction means that propositions are developed from existing theory and they are made testable in the real world. The inductive approach means that theory is systematically produced from gathered data. There is also the combination of the two, the abductive approach, meaning that one may use an approach that alternates between using and creating theory (Dubois and Gadde, 2002). As this project should discuss based on, and concluding from, current theory the *deductive approach* is appropriate.

3.1.3. Research ambition: From exploratory to evaluative

The levels of ambition set for a certain project or problem solving can be deployed in a stairs-like manner, starting with exploratory, then descriptive, explanatory, predictive, normative, implementative, and lastly evaluative, see *Figure 5*³.

As the purpose of the study is to standardize a purchasing process and make it possible to implement at the case company, the ambition is set to the *normative* step. This step is described as explaining how things are or should be, what might be right or wrong, good or bad, and this could be equated with to recommend, to determine, and that to apply the knowledge should contribute to success. (Kasanen et al, 1993)

It could be argued that this research is explanatory, and it is true that it explains underlying circumstances, but it also includes discussions on what the changes or implementation of the recommendations can bring, i.e. is predictive. In addition, since existing theories create the fundamentals for the recommendations to the case company (i.e. knowledge is applied) and since the recommendations should contribute to a better performance, the research does end up on the normative step.

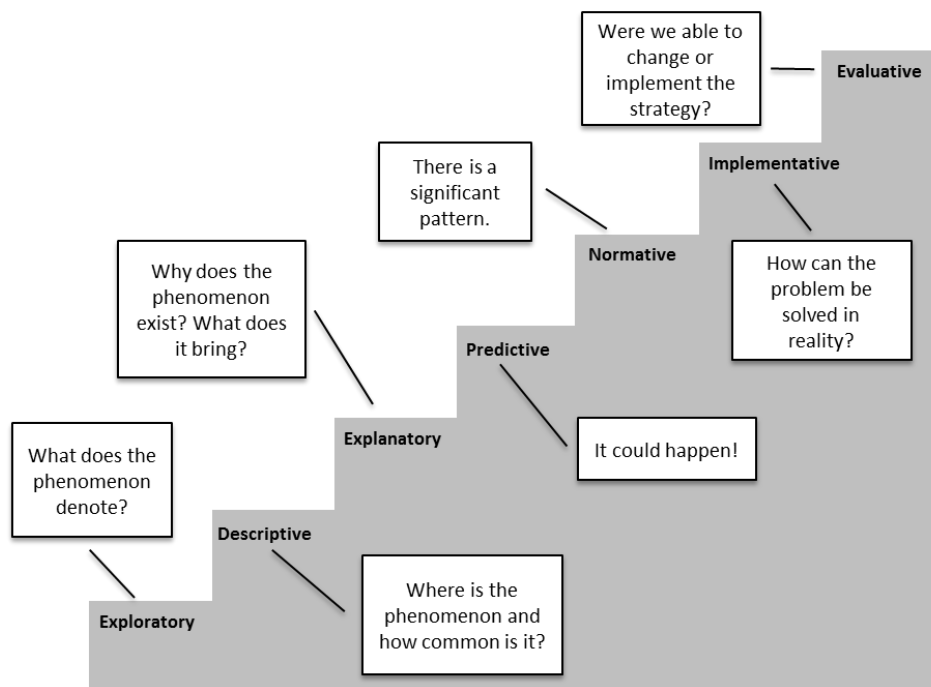


Figure 5. "The knowledge stairs"⁴

3.1.4. Research design

The characteristics of the problem, together with the company specific conditions, point at the fact that this project deals with a real-world problem, anchored in real-world prerequisites, settings and situations. This makes a *case study* appropriate since such studies, according to Eisenhardt and Graebner (2007, p. 25), "*emphasize the rich, real-world context in which the phenomenon occur*", and

³ Bertil I. Nilsson, Faculty of Engineering at Lund University, *Lecture Methodology* course, 2012-09-05.

⁴ *Ibid.*

they also, as mentioned by Yin (2009), empirically describe specific examples of that phenomenon, and are usually grounded in a range of data sources. Using a case study is also highly associated with qualitative research (Denscombe, 2009). The method for the case study used for this research is further described in the coming section 3.4. *Case study method*.

3.1.5. Settled research approach

It is stated by Kasanen et al (1993) that the *constructive approach* is suitable when a) the research is quantitative, qualitative or both, b) the research is goal-directed and hence normative by nature, and c) a case study suits the research well. Therefore, summarizing the discussion above, it is concluded that the constructive research approach, including a case study, would give this project most to gain and thus be a good methodology for it.

3.2. The constructive approach

The constructive approach is a research procedure that, as the name reveals, is used to produce constructions, and constructions refer in this case to “*entities which produce solutions to explicit problems*” (Kasanen et al, 1993, p. 244). Constructive research is used in situations where one wants to define and solve a problem, and improve the prevailing system, process and performance. A constructive research approach builds upon four cornerstones (see *Figure 6*). One part is to tie both the problem and the solution to existing theoretical knowledge and the intention is also to add something to the existing knowledge in the area. The novelty of the solution as well as the working of it should also be verified. (Kasanen et al, 1993; Oyegoke, 2011)

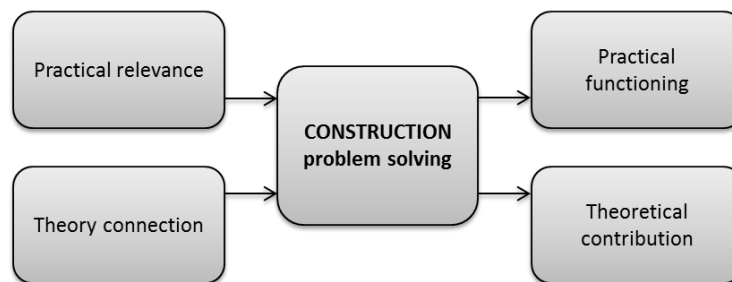


Figure 6. Elements of constructive research (Source: Kasanen et al, 1993, p. 246)

The research process of the constructive approach can be divided into six phases, whose order in practice can vary, be iterative or even recursive (Kasanen et al, 1993). The phases are:

- 1) Find a problem that is relevant in practice and has a research potential.
- 2) Get hold of an overall understanding of the topic.
- 3) Innovate – construct the idea of the solution.
- 4) Demonstrate that the solution can work in reality.
- 5) Show that the solution has a theoretical connection and contributes to research.
- 6) Examine to which extent the solution can be applied to reality.

(Kasanen et al, 1993)

The third step – innovation – is the study’s core element and the critical part, since without the creation of a new solution to the research problem, the study has no relevance. (Kasanen et al, 1993)

3.2.1. Managing the constructive approach's ingoing steps

Finding the problem (1)

The problem found is regarded relevant since Höganäs experience inefficiency and uncertainty in the purchasing process used today. Their procedures are not believed to be unusual, nor are they remarkably badly constructed. This leads the author to believe that although the problem is stated as company specific, it has to be an issue of concern also elsewhere, and has hence both relevance and potential in research.

Understanding of the topic (2)

Step two in the constructive approach deals with obtaining a general and comprehensive understanding of the research problem's theoretical and empirical area. A large amount of case specific understanding was gathered in a one-day event (*the first workshop*, described 3.4.2. *Data collection*) in the beginning of the project, and then it has been expanded throughout the project period by being present at the company and keeping eyes and ears open. A literature study has been grounding for the theories and models used in this project. Not only does this give a background, it also contributes in forming strategies for the data collection and the data analysis. A description on how the literature study was conducted can be found in section 3.3. *Literature study method*, and the result from this, i.e. the project's theoretical framework, can be found in 4. *Theoretical framework*.

Construction of a solution (3)

In the third step of the constructive approach, the solution should be developed. This is the main part of the study and requires a well-formulated strategy. As mentioned earlier, the choice for this project is a case study, and since this method in itself requires a thorough explanation of choices and research design, it is explained in an own section, see 3.4. *Case study method*. The construction itself evolves in chapter 7. *Suggested processes for production process equipment purchases*.

Demonstration of the solution's practical applicability (4)

The time frame of this study prevents the solution to be thoroughly tested. By tested is meant that the construction should be either used in a pilot study or that it should be implemented in a part of the company, or used beside the current way of working. To be able to decide whether it should be fully implemented or not, time is also needed for evaluation and follow-up. When talking about process changes, an implementation of a new process usually requires hands-on changes and new thinking both from managers and other employees, and such things takes time, time that unfortunately does not exist in the scope of this kind of projects.

The solution to this issue in this specific study is to carry through a workshop and follow-up interviews. With these methods it will be possible to theoretically test and challenge the construction by using the practical experience and business and company knowledge of people involved in the purchasing process. With the input from these activities, the solution can be both modified and evaluated, and conclusions can be drawn on the validity and applicability of the solution.

Showing the solution's theoretical connection and research contribution (5)

In this step the researcher should demonstrate his or her findings in relation to existing theory in the area. A contribution to theory can be achieved both if the test of the construction was positive and if it was negative. Theoretical connections and research contribution of this study is elaborated with in 9. *Conclusions*.

Examining the applicability extent of the solution (6)

The scope of applicability of the construction is the last phase of the constructive approach. It deals with taking a step away from the study's specific parts, take a holistic view and consider to which extent the solution can be applied within the case company, and also outside the case company. The generalizability and connected issues will be further discussed in this chapter as well as in 9. *Conclusions*.

3.3. Literature study method

Reviewing the literature is a foundation for both creating and answering the research questions, reaching the objectives and building the research design. The literature study gives an insight into what has already been done in the research area and thus both prevents that the wheel is re-invented and reveals gaps that could be filled. With reliable sources the literature study is also a support for statements in the current research. (Bryman & Bell, 2011)

A literature study is the foundation for the theories and models used in this study. The literature has been found through searching databases connected to Lund University, specifically Summon. This is a database that collects prints, digitals, audio, video, single articles and whole e-journals from a range of sources. However, it has been supplemented by Google Scholar, a search engine focused on scientific publications. The search procedure has in some cases had a snowballing effect, meaning one interesting article has led to one, two or more other interesting articles. Apart from having one article leading to another specific article, Google Scholar has a function that finds articles that has referred to an original article of interest, which the author found very effective. Keywords used for the article search have in a wide sense consisted of e.g. *purchasing process*, *purchasing efficiency*, *efficient purchasing*, *standardization +purchasing*, *portfolio purchasing*, and *segmentation models*. While reading and developing the theoretical framework, more specific searches have been done, e.g. on *specifications*, *Kraljic +critique*, and *supplier evaluation*.

The relevance of the articles and books has been ensured by examining their keywords and abstracts, and then, if those have seemed all right, further by reading the full article. A minimum level of reliability has been set by using peer-reviewed articles and also books that have been referenced to in some of the articles. However, it should be mentioned that some other sources have been used, like web-based journals and dictionaries that are not peer-reviewed (for instance Accenture articles), but they are still recognized sources of information. Some articles have been rejected throughout the process, due to lack of trustworthiness (either by author or publication), and others for non-relevance to the project's topic as it along the way has been more and more specified.

In line with the constructive approach, the literature study has given the author the theoretical basis of understanding the topic. The next step of reaching a solution to the underlying research problem is to

study the problem itself and its surrounding environment. This is done with the case study method explained in the following section.

3.4. Case study method

Case studies used as a research method explain, explore or describe a phenomenon or predict outcomes of it, and emphasize an in-depth and qualitative study of either one or a small number of cases. They “*focus on holistic situations in real life settings, and tend to have set boundaries of interest, such as an organization, a particular industry, or a particular type of operation*” (Ellram, 1996, p. 99). In-depth cases are good methods in understanding the interaction between a phenomenon and the context within which it appears and the method is usually chosen when “*the researcher wants to know how the context of the phenomenon of interest affects the outcomes*” (Ellram, 1996, p. 100). (Dubois & Gadde, 2002)

On top of those reasons the case study is chosen since it is also said, by Denscombe (2009, p. 62), that “*it is particularly suitable for the study of processes and relations in a particular setting*” [translated]. To support the progression towards the recommendations and answering the research questions, the case study method is therefore an appropriate choice. The case study method is in the following described by dividing it into sections of case study design, data collection method, and analysis methods.

3.4.1. Designing the case study

Sampling

Choosing between a single and a multiple case study is an initial question of the method and these support different objectives (Ellram, 1996). Yin (2009) describes five potentials for choosing a single-case study; it is when the case is: critical, unique or extreme, representative or typical, revelatory (previously inaccessible) and/or longitudinal (the same case at more than one point in time). Dubois and Gadde (2002, p. 558) see the single-case study as a natural choice when “*the problem is directed towards analysis of a number of interdependent variables in complex structures*”, where one can “*go deeper into one case instead of increasing the number of cases*”.

As discussed earlier, the case of Höganäs is not an extreme, or critical, case. The result from the case study is therefore likely to be generalizable to the whole Höganäs group and applicable on other cases. Due to this representativeness for companies with similar characteristics (i.e. for instance Swedish, middle-sized, and industrials), the choice of single-case study is regarded a better choice than a multiple-case study since there is more to gain from reaching deeper into one single case than studying more cases.

Unit of analysis

A single-case study can adopt either a holistic design or use embedded units of analysis. To define the unit of analysis is an important part in the design of a case study since it can be said to define the case itself. It is related to the way the initial research questions are stated, to ensure that the case actually is relevant to the questions, and it acts as the operational unit of analysis. (Yin, 2009)

The unit of analysis in this study is the purchasing process of production process equipment at Höganäs. This connects both to the purpose and research questions and makes sure that a holistic view is kept over the whole purchasing process.

Data collection protocol

This data collection overview is a preparation for the data collection and a way to in beforehand ensure the red thread and that the collection is not overloaded and impossible to handle when reaching the analysis. This section gives an overview of the data collection areas. More specific data collection protocols that divide those areas further can be found in *Appendix A* and *Appendix B*.

The data collection has two main goals. The first one is to be able to map the purchasing process at Höganäs on its appearance today. The second objective is to be able to categorize items that go under production process equipment, which is connected to, later on, finding suitable process strategies. In a later phase of the data collection it will be necessary to investigate impacts on efficiency of proposed process changes (in accordance with the fourth step in the constructive approach), and thus this could be seen as a third objective of the data collection. Practical and technical aspects that are relevant for an eventual implementation should also be touched upon. Areas that this may concern are integration or non-integration in the ERP-system, required investments, and education, to mention a few.

Figure 7 is an illustration of the main data collection areas and linked to them are the ways that data will be collected, namely through interviews, conversations, collection of documents, observations, and workshops. A further explanation of these methods and tools can be found in the following section.

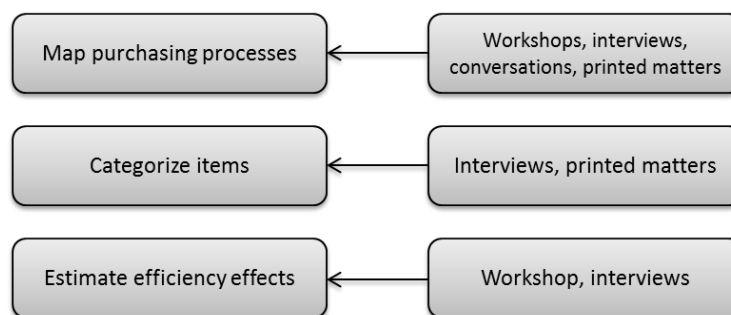


Figure 7. Why and how data is collected in this study

3.4.2. Data collection

Primary sources

As is the case in many qualitative studies, *interviews* have been an important part in gathering data and information. They are said to be very efficient in their way to gather rich, empirical data (Eisenhardt & Graebner, 2007). A selected number of persons highly involved in the purchasing process at different phases have been chosen for interviews and *conversations*. Conversations are used by the means of describing data collection areas in a holistic manner and are therefore unstructured, i.e. unstructured interviews (see *Appendix A*). Semi-structured interviews have been used to follow-up the conversations and contain more specific questions to fill the gaps discovered after processing the first data collections and fulfill the objectives of the research (see *Appendix B*).

The choices of key informants are justified by the researcher wanting a holistic view, and therefore persons from different departments are involved, which also gives different views on the same process which may reveal different kinds of problems. The informants should also be as involved in the purchasing process that they know what they talk about, and have experience both on a managerial level and on a more operational level.

Observations have been used as initial steps in gathering data and information about documentation concerning the purchasing process, as well as how the purchasing processes is conducted within the ERP-system. This basically means that the author has been shown how and where to find information within the company's information systems, but the observations have also been opportunities to ask questions. So-called field notes have been written at these occasions to be able to remember important outcomes.

At two occasions *workshops* have been conducted – one in the beginning of the project and one in the end of it. The first one contributed to the author's company specific information and knowledge gathering, with respect to phase number two in the constructive approach (to get hold of an overall understanding of the topic), as well as it was a networking opportunity. During a day-long session, the purchasing process of production process equipment was described and discussed together with six persons; the Purchaser of Investments and Services and the Purchaser of Maintenance and Services from the purchasing department; the Manager of Production Supplies from the warehouse and goods receiving; the Manager of Mechanical Engineering, the Manager of Electrical Engineering and the Engineering Manager from the technical department (Engineering and Process Improvement).

The second workshop was used to fill small gaps of data collection still remaining, but mainly it was an opportunity to challenge the suggested ideas of the solution and to validate those by having a discussion with the decision makers. The efficiency aspects were particularly discussed, and some thoughts about implementation requirements were raised. The persons present at this event consisted of eight persons; with a lack of the Purchaser of Maintenance and Services and with addition of the Supply Chain Manager from the supply chain department, a Quality Assurance Engineer from the quality assurance department and a Purchaser from the purchasing department, the constitution was the same as in the first one.

Regarding specific issues still remaining after the second workshop, follow-up questions were answered by concerned managers through *e-mail correspondence*.

In *Table 1* the different informants are stated together with what kind of data gathering method that was used for the specific reference. Those references are thus the ones that are referred to in chapter 5. *The case company*. A thorough reference list of the case company respondents is provided in *Appendix C*.

Table 1. Methods corresponding to the oral references within the data collection chapter

Method	Reference
Unstructured interviews	Bolin, 2012 Löfgren, 2012 Nilsson, 2012 Windén, 2012
Semi-structured interviews	Olsson and Palmquist, 2012 Äglid, 2012
Workshops	Molin et al, 2012 Westman et al, 2012
Conversations	Westman, 2012
E-mail correspondence	Molin, 2012 Olsson, 2012

Secondary sources

Printed data sources have been examined as well. Examples of such are function descriptions, which describes how e.g. the purchasing function should work, purchasing orders, requests for quotations, quality documents, and management descriptions. Those examples are of the kind of gathering specific information. For an overall understanding other printed matters has also been used, e.g. annual reports.

3.4.3. Analysis methods

According to Yin (2009) there are four general strategies to use when analyzing case study data, whereas the most appropriate for this study would be *relying on theoretical propositions*, which is also the most preferred strategy. This strategy aims at linking the objectives, the research questions, and the literature study, which was structured by the first two. The theoretical suggestions and inferences also shaped how the data collection was performed, and this explains why the analysis should continue in the same manner. It also helps in deciding on which data to focus and which can be ignored. (Yin, 2009)

The analysis' placement in the study

The analysis will take its starting point in the first two of the objectives of the data collection described earlier. The efficiency aspect is the one that will enter in a later phase of analysis. With reference to the illustration in *Figure 8*, where the data collection parts are also shown, the case analysis will evolve around a *gap analysis*. This is a tool that helps identifying elements for improvement of a process' quality by benchmarking a current state with a desired future state (Bigwood, 1997). This part of the analysis should thus compare the actual situation at the case company with literature, which in this case is seen as best practice and this will point at discrepancies, i.e. where changes should be considered. The analysis will formalize into the construction of an idea of the final solution, i.e. what a structured process can look like. This is where the data collection on efficiency comes into the analysis. An analysis on how the efficiency is impacted, or can be improved, leads to the final suggestion.

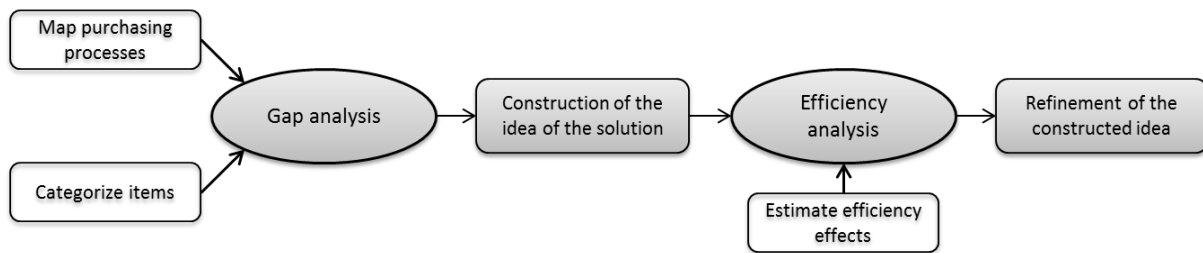


Figure 8. The analysis' places of contribution in the study

Coding

Coding is a way to structure the data analysis and is done in most qualitative research. The gathered data should be coded as soon as possible throughout the data collection period. It is possible to code the same data in more than one way and the coding could also be done at different levels. There is no widespread way of coding data, it should be adapted to the requirements of the specific research, but it should enable the sorting and fragmentation of the collected data. (Bryman & Bell, 2011)

Coding has in this study been used to divide the collected data into the three main data collection areas described earlier; process, items, and efficiency. Further subdivision of those areas has not been considered necessary. This means that this study's analytical method is only grasping upon the area of coding, since it is common to have many codes and many levels of them. Nonetheless, the use of coding to this small extent has been useful and has helped in reducing the data into those codes. The more hands-on way of dividing the data into the coded groups has been to keep it in different folders. When completing the report chapter including the collected data it was discovered that overlaps between the groups were needed to get a smooth structure, which points at the fact that data often needs to be coded in more than one way.

Analysis frameworks

There are two main frameworks that have been used for analyzing the gathered data and information. For the area of purchasing processes the underlying idea of how a purchasing process should be structured is gathered from van Weele (2010). This work has been extended by investigating the different purchasing steps from more points of views, e.g. Cardozo (1983) and Baily et al (1998), which can be seen in 4. *Theoretical framework*.

The main framework for item categorization and corresponding category-adapted purchasing strategies has been Kraljic's purchasing portfolio model, developed in 1983. This is most apparent in developing the solution to the problem, i.e. the construction within the methodological approach of this study. The applicability and use of the portfolio model is also described in 4. *Theoretical framework*.

3.5. Summing up the methodological process

One way of illustrating the different levels of abstraction within research is the one by Saunders et al (2007, p. 102). They call it "the research onion" wherein different layers of an onion can illustrate the different research levels. The outermost layer tells us that there are human perceptions and constructions, grouped or divided into different philosophical views, which underlie how people

approach a research issue. The background with which one enters a situation does also consist of a level of knowledge in related topics that are more down to earth than any philosophy, but they usually have connections to each other. An example is the natural scientist presumably adopting the positivist philosophy meaning science should be conducted in a way that is objective and observing reality can bring law-like generalizations. The closer to the onion’s core, the more concrete the research layer gets. (Saunders et al, 2007)

Summarizing the methodological approach for this project, inspiration is taken from Saunders et al’s (2007) “research onion”. In *Figure 9* the specific choices within this project (justified and explained throughout this chapter) are placed in such an “onion”, showing the different layers of this research.

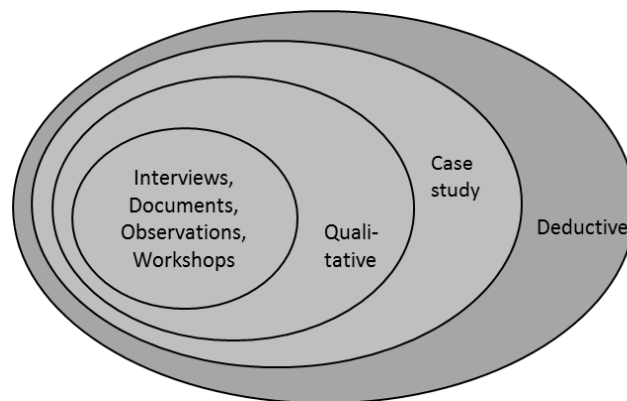


Figure 9. The research onion of this project (Inspired by Saunders et al, 2007)

The sequence of the chapters in this report generally follows the methodological work sequence that has been used, see *Figure 10*. Most parts have however been worked on in an iterative way to improve them along the way.

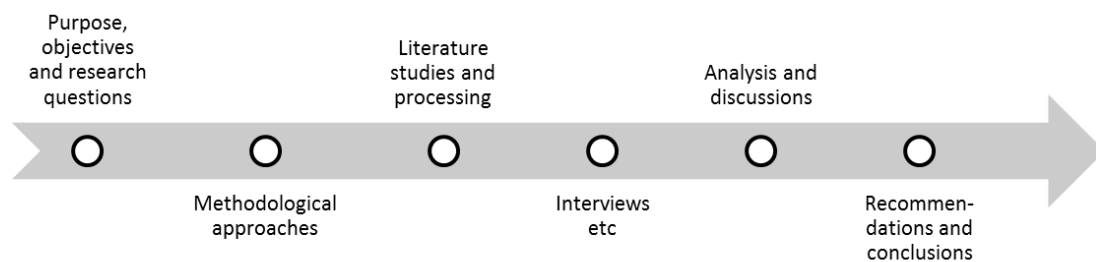


Figure 10. Sequence of work in this project

3.6. Quality aspects and trustworthiness of the study

3.6.1. Weaknesses and strengths of chosen methods and tools

Table 2, compiles weaknesses and strengths of the chosen method that were described, as well as the ways to gather data.

Standardizing purchasing processes

Table 2. Weaknesses and strengths of chosen methods and tools

Method	Weaknesses	Strengths
Case study research	<ul style="list-style-type: none"> • Might be seen as “<i>simply rich descriptions of events from which the readers are expected to come to their own conclusions</i>” (Dubois and Gadde, 2002) • Can turn out to be just an “<i>example of data that appear to provide [...] partial support of particular theories or frameworks and are used in a quasi-deductive theory testing way</i>” (Dubois and Gadde, 2002) • Seems to be no opportunity to make statistical generalizations (Kasanen et al, 1993; Denscombe, 2009; Flyvbjerg, 2011) • Is said to only produce “soft data” and is inappropriate for analysis and drawing conclusions (Denscombe, 2009) • Hard to define the boundaries in an absolute and distinct way (Denscombe, 2009) • Weak understanding of occurrence in population of phenomena under study (Flyvbjerg, 2011) 	<ul style="list-style-type: none"> • Gives the researcher a chance to examine (Denscombe, 2009) • Enables the use of a range of research methods (Denscombe, 2009) • Enables the use of a range of data collection tools (Denscombe, 2009) • Is especially appropriate when the researcher cannot control the events. Since the events should be studied the way they appear, the researcher is not forced to control the circumstances. (Denscombe, 2009) • Is appropriate in small-scale research since it concentrates the efforts to one (or a few) study site (Denscombe, 2009) • Depth – detail, richness, completeness (Flyvbjerg, 2011) • Understanding of concepts and process as well as of what causes a phenomenon and linking causes and outcomes (Flyvbjerg, 2011) • Fostering new hypotheses and research questions (Flyvbjerg, 2011)
Documentation (as data source)	<ul style="list-style-type: none"> • Retrieval (can be difficult to find) (Yin, 2009) • Biased selectivity, if collection is incomplete (Yin, 2009) • Reporting bias (by the author, unknown) (Yin, 2009) • Access – may be deliberately withheld (Yin, 2009) 	<ul style="list-style-type: none"> • Stable – can be review repeatedly (Yin, 2009) • Unobtrusive – not created as a result of the case study (Yin, 2009) • Exact – contains exact names, references, and details of an event (Yin, 2009) • Broad coverage – long span of time, many events, and many settings (Yin, 2009)
Interviews (as data source)	<ul style="list-style-type: none"> • Bias due to poorly articulated questions (Yin, 2009) • Inaccuracies due to poor recall (Yin, 2009) • Reflexivity – interviewee gives what interviewer wants to hear (Yin, 2009) 	<ul style="list-style-type: none"> • Targeted – focuses directly on case study topics (Yin, 2009) • Insightful – provides perceived causal inferences and explanations (Yin, 2009)
Observations (as data source)	<ul style="list-style-type: none"> • Selectivity – broad coverage difficult (Yin, 2009) • Reflexivity – event may proceed differently because it is being observed (Yin, 2009) 	<ul style="list-style-type: none"> • Reality – covers events in real time (Yin, 2009) • Contextual – covers context of “case” (Yin, 2009) • Insightful into interpersonal behavior and motives (Yin, 2009)

Measures have been taken to prevent or at least minimize the impact of the negative factors of chosen methods. In the following further descriptions of those actions are provided.

3.6.2. Validity and reliability

The quality and the trustworthiness of a research design can be judged by a range of logical tests. Yin (2009) distinguishes between four different such test, construct validity, internal validity, external validity and reliability, which will be discussed in the following. The main validity condition within the constructive approach is naturally that the construction works, that is, that the problem is solved (Kasanen et al, 1993).

Construct validity

The significance of construct validity is to identify proper operational measures for what is studied. It is thus a part of the data collection phase and the main case study tactics for dealing with it is to use multiple data sources, to establish and maintain a chain (i.e. the red thread) of evidence and to have key informants review the draft of the study report. (Yin, 2009; Ellram, 1996)

Multiple data sources have been used. This means for instance that different interviewees have been given a chance to explain their points of view, and collecting data from multiple sources contributes to the construct validity of this study. This report has been reviewed by four external readers, as well as two supervisors involved in the entire process of the project (see *Table 3*). This should provide a verification of the logical flow, i.e. the chain of evidence.

Table 3. Reviewers and their roles towards the report and the author

Reviewer	Role to this study and report
University supervisor, Ph.D. student, M.Sc.	Is naturally one of the two mainstays of the project and has a role in each part of the project; from creating a stable foundation and ensuring the academic requirements to making sure of the red thread and a proper tying together.
Company supervisor, Engineering Manager	The other mainstay, who also has a role in the development of the study and whose main part in reviewing is to see to that no misunderstandings or errors have been incorporated into the text.
Opponents, M.Sc. students	Two master's students that review the report as part of their own examination, with the objective to point out weaknesses anywhere in the report and critically scrutinize each part.
Friend, Ph.D. student, M.Sc.	A person within the academia who understands the academic requirements of the study as well as the report. Is also a close friend and therefore do not hesitate to deliver honest criticism.
Family member, holds a MBA	Read the report with "fresh eyes" in the purpose of making it understandable for people outside the purchasing area, and also gives honest and thorough criticism.

Internal validity

Internal validity means that the researcher tries to demonstrate or establish a causal relationship. It is only interesting for explanatory and causal studies, where the researcher should explain why event x leads to event y. The internal validity deals with preventing incorrectly conclusions of causal relationships. Tactics to do this mainly concerns the data analysis and are for instance to do pattern matching and to use logic models (Yin, 2009; Ellram, 1996). The causality is not emphasized in this study, since its purpose is not to explain why certain events happen.

External validity (Generalizability)

External validity deals with the question on whether the findings can be generalized beyond the certain case study and it is dealt with within the research design. Lack of ability to generalize has been the main criticism of case studies, and especially when compared to survey research that are grounded in statistical findings. However, the goal of such research is to generalize whilst case studies “*are generalizable to theoretical propositions and not to populations or universes*” (Yin, 2009, p. 15). This means that a case study does not represent a sample and the objective is to do analytic generalizations and not statistical ones, hence the ability to generalize results from case studies tends to be of qualitative nature. (Yin, 2009; Ellram, 1996)

The aim of the solution to the research problem is that it should be adaptable to other Höganäs sites. This is handled by for instance not going into small details in the purchasing process. However, since the case is believed to be a typical one, the solution will be possible to adapt to other companies despite a change of inputs.

Reliability

The reliability test deals with the repeatability of the study and if the same procedures will achieve the same results. However, it is about performing the same case over again, not another case with the same procedures. The opportunity of checking each phase in the construction, given by the constructive approach, gives the possibility for anyone to try out the solution and attain similar results as the original construction. To deal with the issue the researcher can use a case study protocol and develop a case study database. The protocol may for instance include interview guides, which can be based on the research issue and the research plan. (Yin, 2009; Kasanen et al, 1993; Ellram, 1996)

A reference list with interviewees and also some internal company documents, used for the data collection, is provided together with this report. This is sometimes seen as unconventional when using the Harvard reference handling system (which is done in this report) since the reader cannot check these kinds of sources, and they should only be mentioned where its data is presented (HB, 2012). It is true that the reader cannot check those sources, however, if it should be possible to repeat the study and achieve the same results, the same data sources need to be used. This is why the author has decided to state all respondents explicitly and together at the end of the report.

Data collection protocols was developed for this study (and can be found in *Appendix A* and *B*), which contributes to the reliability of the study. Based on comments from supervisors the protocol was iteratively refined. However, a full case study protocol did not seem relevant. Firstly because this is a single-case study, which does not need the ability to iterate the same process over and over again, and secondly because the size of the report is as small as the table of contents gives a decent overview of how both the case study and the whole project was created and completed. The overall purpose of this chapter (*3. Methodology*) is also to increase the reliability of the study, particularly by describing each step taken and thereby simplify for others to repeat it.

Lastly but maybe most importantly the whole project process has been supervised by both Lund University and Höganäs, an established academician and a company manager, through regular meetings and e-mail correspondence in between. The reviewing of the report, not only by the

supervisors, friends and family, but also by the opponents who are master's students with the task to thoroughly and critically examine the report, contribute to the reliability.

3.6.3. Objectivity and criticism of chosen data sources

The project has been conducted at the technical department (Engineering and Process Improvement) at Höganäs. The main reason for this is that the company supervisor, who is also the department manager, currently works at this department and that his knowledge and previous experience reaches over a number of different functions, which will be advantageous in many ways. The purchasing department will to the highest degree be involved in this project. However, it is also valuable to note that the placement at the technical department is beneficial in getting the desired holistic view; it forces the author to use a supply chain perspective. The technical department is also the place where a lot of needs for PPE, production process equipment, purchases arise; therefore at the root of the process triggering and where many buyers are located.

All interviewees are employed by the case company which may damage the objectivity of the study. However, the answers needed to complete the study could not possibly have been gathered from anyone else. Many of the informants in this study are situated at the technical department and thus the proximity to those data sources is strong. This can be both beneficial and disadvantageous. It gives the author a chance to really understand the issues and questions arising from the initial problem, as well as it is practical and helpful since it enables fast communication and quick answers to short questions. What might be seen as a drawback is that the author is becoming a part of the case instead of being an objective observer. Connected to this is also that indications, directions and control from the case company may become less distinguishable. However, this is kept in mind by the author, and following the stated data collection and data analysis plans, as well as the overall methodology, is aimed at minimizing those factors.

The data sources and the informants have been chosen by the information and knowledge they contain respectively possess. Suitable interviewees have been pointed out by the company supervisor and during conversations and interviews it has become evident to the author that those persons do possess relevant information and large amounts of knowledge. Regarding gathered documents, their relevance have been stated according to the question on whether they are parts in reaching the study's objectives. Some documents that seemed relevant during collection may have been rejected during analysis if they do not contribute to the purpose of the study.

It is obvious that the results could have been different if other sources had been chosen. On the subject of informants, as mentioned, they were still regarded appropriate choices after the conversations and they contributed to the data collection the way it was planned. Documents and related material exist in large quantities, but with the help from qualified employees together with the author's judgment on what is relevant for the purpose, chosen data sources contributes appropriately and stays within the boundaries of the study.

3.6.4. Ethics, confidentiality and property issues

The author has worked under the same ethics and confidentiality as any employee, which have been stated in the beginning of interviews and conversations in the purpose of making the informants comfortable and free to speak. However, it has also been stated that this report is a public document

and if any information should not reach the public, the informants have been asked to specify this when talking about it. The content of the report has been reviewed before publication by the company supervisor to avoid false illusions and misrepresentations; however, the author takes full responsibility for what is stated in this report.

A range of situations where the confidentiality comes into question have been encountered. This regards names of suppliers, purchasing spends, individual amounts of money for purchased items, inventory values and so on. Naturally, such information has been disguised and is not mentioned in the report, but this is not considered to have limited the quality or the scope of the results.

In accordance with common sense, data collected during the study have been kept in a secure manner and it has, and will, only be used in the specified purpose.

The owner of this project is Richard Molin, Supply Chain Manager at Höganäs Sweden AB. The use of company internal figures and the publication of the information contained in this report have been approved by the project owner. The author takes the full responsibility of any misinterpretations of gathered information, even though much effort has been put in eliminating everything of this kind.

4. Theoretical framework

The theoretical framework gives the reader a broad description of the theoretical areas related to the study and needed for the forthcoming analysis and the forming of the conclusions and recommendations. The main topics treated are the purchasing process, standardization of processes, purchasing portfolio models, and the efficiency concept within purchasing.

A guide through the different parts elaborated on in this theoretical framework is provided in *Figure 11*. The decision on bringing those parts into this framework stems from the purpose and objectives of the study. The framework starts off with the concept of purchasing processes. It is evident that purchasing processes deal with taking care of the buying of items and presumably in a correct manner. Since the objective of this study is to standardize this manner, this has to be examined to an acceptable extent. The concept of process standardization is therefore described after processes. It is also important to examine what the correct manner might be, and this is the summation of purchasing portfolio models, its applicability and benefits as well as purchasing efficiency aspects.

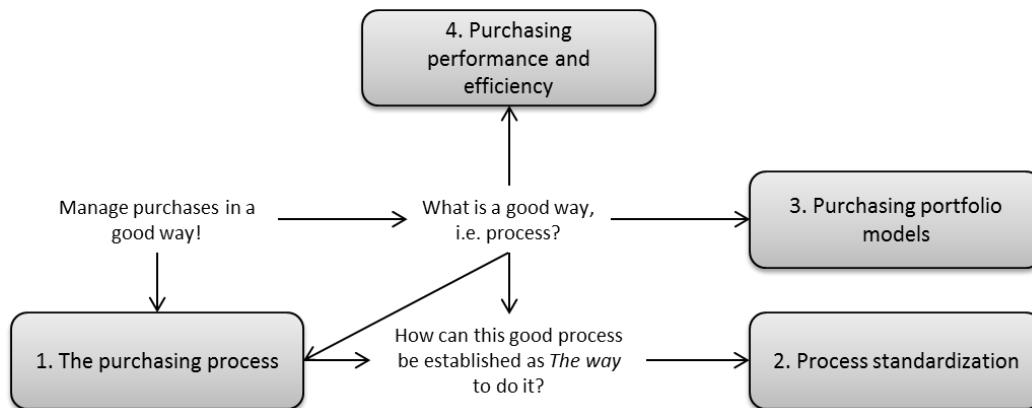


Figure 11. The flow through the theory parts

4.1. Purchasing processes

4.1.1. The purchasing process as one unit

The different activities within purchasing are clearly interrelated and dependent on each other, and they can be organized in a process, where it is implied that they take place after each other in time (van Weele, 2010). However, this purchasing process has been defined by many and in nearly as many different ways (e.g. van Weele, (2010), Woodside and Samuel, (1981), Xideas and Moschuris, (1998) and Abratt, (1986)). Usually researchers emphasize the same kinds of activities (e.g. specification, preparing requests for quotations, select suppliers, negotiate and so on) although with different denominations, (e.g. specifications or developing requirements), but the main difference lies within how these activities are grouped. Woodside and Samuel (1981) distinguish four events; developing and analyzing requirements, preparing RfQs and analyzing quotations, committee-supplier negotiations and post-negotiation evaluation and reporting. Xideas and Moschuris (1998) also use four phases; initiation, search, selection and completion. The most common number of identified steps or phases in the purchasing process does, however, seem to be six to eight, se for instance Abratt (1986) who examined high-tech markets, Cardozo (1983) who modeled the sequence of decisions in

industrial buying, Lilien and Wong (1984) who investigated the structure of buying centers in the metalworking industry, and Smith and Taylor (1985) who also examined organizational decision making.

After an examination of the number of stages in the purchasing process, an appropriate number of phases to describe the process seem to be six. This is justified by the simple reason that four is seen as too little since that does not give a sufficient description of the process, while eight phases gives unnecessary detailed descriptions for the scope of this study. A six-phase process have been explicitly described by van Weele's (2010) *Purchasing process*, and this make up the base for further descriptions of the phases in this study.

An illustration of the purchasing process is shown in *Figure 12*. The overall process perspective is highly emphasized in connection to examining the ingoing activities, due to the viewpoint that they are interconnected. More specifically, this means that the quality of an output from one step in the process defines the output quality in the subsequent activity. Examples of the dependence are that inadequate specifications may lead to a poor quality of the incoming goods or that purchased materials that do not meet requirements may lead to rejected deliveries. A delivery problem can often be linked to a late requisition from another department, which leads to not only higher prices, but also higher organizational costs and operational problems (due to that the products are not in accordance with specifications, partial deliveries or postponed deliveries). Van Weele's (2010) suggested purchasing model is said to be able to help managers structure the process, both in decision-making and operations, which lead to decreased organizational costs and higher productivity. (van Weele, 2010)

The first input of the model is a business need or requirement. The changing business need can be more or less defined but it is, however, the one thing that triggers the process to start. The model also has an important point in that defining the interfaces between the phases is essential. This means that a clear definition of each phase's output is required as well as it is desirable to be able to track and trace the different activities throughout the process. The activities in one step should not start until a decision from the previous step tells it is all right. This can be conceptualized through documentation of the results from each step, which also helps to structure the process. It is common that companies have a manual where their purchasing procedures are explained (and documented) – without them, the decision-making process gets unstructured and operational problems arises. (van Weele, 2010)

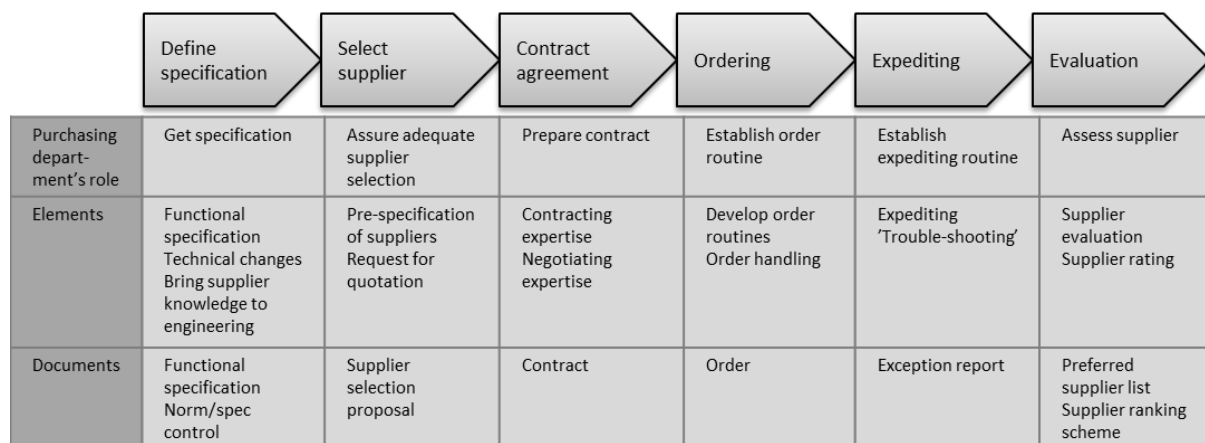


Figure 12. The purchasing process approach (Source: van Weele, 2010, p. 29)

4.1.2. The process steps

Naturally, the initiating step of the purchasing process is a need for a product within a company. However, it can be said to consist of partly the recognition of the need, or rather, the problem, and partly that solving this problem can be done through a purchase. The problem must be made clear within the organization and then someone with the authority has to start the process. The authority and the initiating is usually not a major concern but someone has to decide that the need is important enough to do something about. (Robinson et al, 1967)

Specification

In this first step all the requirements of the purchase should be specified. It is common to separate specifications into two parts; functional specifications and technical specifications, as mentioned by van Weele (2010), or performance specifications and conformance specifications, as mentioned by Baily et al (1998). However, they have the same meanings; the functional specification is important for service purchases, but is applicable also for products since it describes the buyer’s desired functionality of the purchase (Baily et al, 1998). The use of functional specifications brings about at least three advantages; suppliers are given a chance to use their full expertise as the specification’s details are in the hands of them, innovation is not inhibited, and it opens up for one standard against which the buyer can evaluate all supplier proposals (van Weele, 2010). The technical specification, on the other hand, sets the technical characteristics of the product (e.g. a technical drawing) and the supplier’s expected activities (e.g. a schedule). These two specifications make up the *purchase order specification*, which can be further divided into quality, logistics, maintenance, legal and environmental, and financial specifications (see *Figure 13* for an illustration and description) (van Weele, 2010). The specifications usually appear on a purchase requisition or any equivalent document, and may even detect suppliers or limit the types that are considered to be appropriate (Cardozo, 1983).

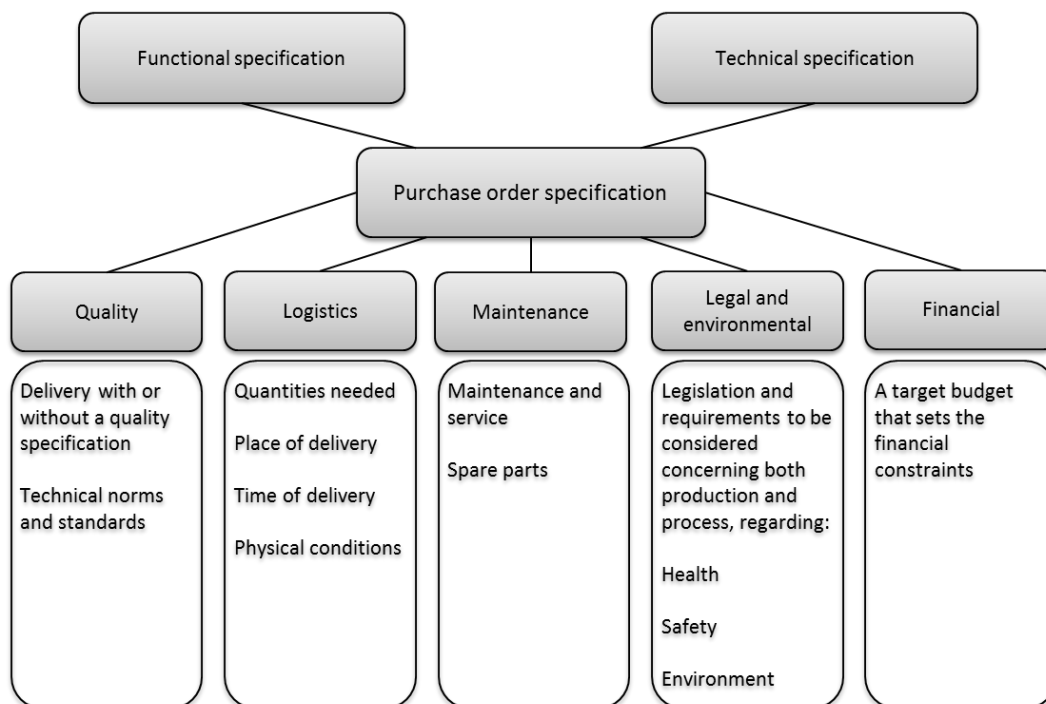


Figure 13. Purchase order specification and its building blocks (Ad. from van Weele, 2010)

Specifications may differ in complexity, i.e. the degree of precision and flexibility, from only being statements of the purchase objectives to detailed requirements, including cost and quality (Cardozo, 1983). Some problems may arise during the specification phase and this has been explored by Karlsson et al (1998). Regarding the technical content they found that sometimes specifications are incomplete or too general and did not explain product requirements well enough. This usually delays the operational design work as well as the costs for it since more time is needed to make out the meanings of under-specified specifications. It could be that the specification should only be a guideline for the supplier, but in such a case there should naturally be an agreement of this between the buyer and the supplier. The technical specification can, on the other hand, also be over-specified. Examples of this are too narrow tolerance levels, which prevents the item to be produced, or extreme materials or functional solutions that are impossible to realize. Over-specifications also cause the need for extra time, (or that time is wasted from another point of view), as well as increased costs, usually without any improvements on the functionality. (Karlsson et al, 1998)

Both over- and under-specification, as well as mistakes, imply changes in specifications, which mean rework for either the buyer, the supplier or both, and a postponed product development process. Most of the problems connected to the specification phase are related to not involving the supplier early enough and/or in-depth enough in the product development (van Weele, 2010). Before the specification is sent out to a supplier, it must be approved by this potential supplier or the purchasing function, to prevent misunderstandings later on in the process, decrease specification changing costs, and in the extension reduce the total engineering lead time. (Karlsson et al, 1998)

Supplier selection and supplier assessment

The previous step is usually completed having some suppliers in mind but in this step the actual supply market research is taking place (van Weele, 2010). The common conditions to look at when selecting suppliers are quality, price, terms, delivery, service, and experienced performance on previous orders, and examples of attributes of a good supplier is that he delivers on time, provides a consistent quality, has a stable background, provides a good service backup, and is responsive to the buyer's needs (Baily et al, 1998). Supplier assessment, i.e. evaluation of a supplier's preliminary capability to meet the specification, is usually done through one or more out of the following methods:

- Past performance; is of course dependent on statistical records but include data on for instance delivery, performance, and service. This information is often used for supplier rating or evaluation as well.
- Reputation; is a frequently used method. Based on actual performance, suppliers gain their reputation which can be a valuable asset. Often suppliers are asked to give customer references, which enables the buyer to get information about the supplier if self-experienced records are lacking.
- Visit and appraisal; both takes time and can be expensive but it is a good way to assure quality.
- Third party certification; are made by independent organizations, not connected to the buyer or supplier, and published in the form of e.g. quality certificates.

- Evaluation of sample products; is actually usually done as an inspection when the goods have been delivered, and lead to an acceptance or rejection from the buyer, but it affects the way the supplier is treated afterwards or in future supplier selections.
(Baily et al, 1998)

The result from the supplier assessment is the *bidder's long list* that contains the suppliers that may come in question for the purchase, usually suppliers that earlier have proven to perform well (van Weele, 2010). It is to the suppliers on the long list the requests for information (RfI) will be sent. The response on the RfI, maybe together with supplier visits, results in a reduction of the bidders' list, i.e. determines which suppliers are still possible vendors after the RfI, and a supplier short list is created. Next, the requests for quotation (RfQ) are prepared and sent to the remaining suppliers who are asked to submit a bid meeting the requests in the RfQ. Hopefully possible suppliers still remains but if not, another (new) market research has to be done. The point with one structured RfQ is that the suppliers should be easily compared, and that it should be possible to identify three to five potential suppliers that together make up the *bidders' short list*. (Cardozo, 1983)

Quotations from these suppliers are thoroughly examined; technical and commercial evaluations and weighing of technical, logistic, quality, financial and legal aspects. This ends up in a supplier selection proposal containing the supplier selection decision, the ranking scheme used to evaluate the suppliers and the considered quotations. The step is finished by a selection of one supplier with whom negotiation will start. (van Weele, 2010)

Negotiation and Contracting

The negotiation and the contract will look very different depending on line of business and companies involved. Product specific technicalities, company specific settings and legally binding conditions may be included, e.g. commercial terms, purchasing policies, company culture, market situation and product characteristics. This makes the use of standardized contracts limited and implies that many conditions need to be negotiated, for instance prices and terms of delivery, terms of payment, penalty clauses and warranty conditions. (van Weele, 2010)

“Managers may spend up to 20 percent of their time negotiating. But they spend precious little time on considering how to negotiate.”

(Byrnes, 1987, p. 7)

Baily et al (1998) divides the negotiation step into a pre-negotiation, a meeting, and a post-negotiation phase. The importance of preparation cannot be emphasized enough. The time spent on this should reflect the complexity of the negotiations, but usually not enough preparation is done. Concerning long-term relationships with suppliers, the preparation should be considered as nearly continuous, especially regarding information gathering. Three issues should be considered as a preparation. The first one is to be sure on what is wanted; maybe this is not crystal clear in beforehand but the limits on different variables, e.g. price, delivery time, quality, should be. The second question to ask is how valuable each of the wants is, and hence on which priority each of the different variables should be negotiated over. The third issue should be to decide upon the entry and exit points; what are the actual opening bids and at what point should one 'walk away'. It is also important that all persons involved in the negotiation together have decided upon these limits in different dimensions and which strategies to use, before meeting the suppliers. (Baily et al, 1998; Woodside & Samuel, 1981)

The meeting phase deals with the buyer and supplier agreeing on the different terms and conditions. This can be done in different ways and the strategy the buyer chooses usually depends on the on-going and the desired relationship with the supplier, e.g. whether to go into the discussion with an aim to win or to compromise. The more product-related the decision points are, the more the need for specialized knowledge is required from the buyer. This knowledge should be possessed by the buyer independent on the relationship with the supplier. The end of the meeting phase is hopefully an agreement, which concludes the negotiations, and the full details should preferably be recorded. This, together with preparing contracts, ensuring the commitment with people involved, and ensuring that the agreement is implemented, constitute the third and last phase of negotiation, i.e. the post-negotiation phase. (Xideas & Moschuris, 1998; Baily et al, 1998)

Ordering and Expediting

In this step the order is placed through a so-called purchase order, which is initiated by a purchase order requisition and follows the agreements made during contracting (Cardozo, 1983). It is usually important to specify purchase related information to the supplier; an order number, a short description of the product, unit price, number of units ordered, delivery time or date, delivery address and invoicing address (van Weele, 2010). This information also has to be stated by the supplier on delivery documents and invoices, and for each product if the purchase order contains several lines, which is usually the case (Cardozo, 1983). The supplier is generally asked to send a purchase confirmation for each order (*ibid.*).

Three different types of expediting may be outlined. In the first one, *exception expediting*, the purchasers become aware that the delivery is late via the internal customer, which implies instant actions from the purchaser in accordance with the importance of the product to the company's, or the internal customer's, operations. Another method is to *act preventive*, which can be done through routine status checks. This means that the buyer contacts the supplier in advance of delivery to confirm that everything is going according to plan, or in worse cases, be aware of any late deliveries. For really critical purchases, the *advanced status checking* may be applicable. This is more time-consuming and means that the buyer makes on-site inspections to check progress of ordered products. (van Weele, 2010)

At delivery, products have to be controlled to make sure that they meet the specifications outlined in the purchase order (van Weele, 2010). This is thus a quality test and it can be done through a so-called acceptance test, which is a technical test made at either the supplier's or the buyer's site or both to check if the functional and technical requirements are met. The acceptance test decides upon whether to accept or reject the delivery. It can also be completed after the product has been put to place, especially if the product is equipment that should be used in operations. (Maxim et al, 1975)

Follow-up and Evaluation

After the purchased product has been put into production or operation there is still work to do for the purchasing department. This includes warranty claims, penalty clauses, invoice administration, update and archiving purchasing and supplier files, evaluations of supplier and project, and after some time also maintenance agreed upon with the supplier (e.g. service and spare parts) (van Weele, 2010). The follow-up and evaluation phase does hence concern both the supplier's performance and the

performance of the product that was delivered, i.e. how well the product solved the initial problem or need. (Robinson et al, 1967)

The supplier evaluation is a continuing process, usually performed by the purchasing department (Baily et al, 1998). For future purchases and for the vendor rating it is important to keep an up-to-date record of capabilities, quality and deliverables of suppliers (van Weele, 2010). Feedback regarding this information is crucial to be able to handle future purchasing problems accurately (Robinson et al, 1967). The information can also be used to form the bidder's short list as a guideline for future purchases, containing suppliers with verified capabilities (van Weele, 2010). This is a strategic implication since it helps the company to decrease its supplier base and concentrate on suppliers that can add value to the bottom line of the company. (Baily et al, 1998; van Weele, 2010)

The scope of evaluation depends on the strategic importance of the purchases and the suppliers, as well as value and volume – large and important spends justifies more thorough investigations. However, unusual and first-time purchases, where the buyer has little knowledge about the supplier, could also justify a larger effort in evaluation. Different levels of supplier evaluation may be used; product level, process level or company level, as well as different methods; for example spreadsheets, vendor rating, and supplier audits. (Baily et al, 1998; van Weele, 2010)

4.1.3. Buying situations

The entire process, shown in the illustration (*Figure 12*), is not likely to go through in each and every purchase. This is the illustration of an item (or service) purchased for the first time, where all steps are required (van Weele, 2010). Robinson et al (1967) distinguishes three different types of buys, or rather purchasing situations; the new-task situation, the modified rebuy, and the straight rebuy. The characteristics of those are outlined in *Table 4*.

Table 4. Characteristics of buying situations (Source: Robinson et al, 1967, p. 25)

Buying situation	Newness of the problem	Information requirements	Consideration of new alternatives
New task	High	Maximum	Important
Modified rebuy	Medium	Moderate	Limited
Straight rebuy	Low	Minimal	None

When the company stands in front of a need that has not arisen in the past, the purchasing experience is little or none, and very much information is needed to complete the purchasing process, the new-task situation occurs. This also means that the specifications have to be set from nothing, which implies a high risk and uncertainty, and that suppliers are unknown. The decision-making process becomes long since more than one hierarchical level will be involved and is it characterized by problem solving. (Robinson et al, 1967; van Weele, 2010)

In the modified rebuy either the product or the supplier is new and the other existing and it usually appears when there is dissatisfaction with the supplier or when seeking cost reductions or quality improvements (Robinson et al, 1967). A modified rebuy situation may also appear due to external factors like an emergency or from marketing actions (van Weele, 2010). The decision-making process include limited problem solving but some additional information is required before decisions can be made, however, the risk level is lower compared to the new task since either functionality of the

product or how to select the supplier is known (Robinson et al, 1967). In the purchasing process it is particularly the last four steps that should be handled (van Weele, 2010).

The most frequent situation is the straight rebuy where both product and supplier are known in beforehand. They are handled on routine and usually by the purchasing department solely, or after negotiations completed by the purchasing department, ordered by the internal customer through long-term contracts. No or very little new information is needed and suppliers are chosen only from an accepted list. The straight rebuy only considers the last three steps of the purchasing process model. (van Weele, 2010; Robinson et al, 1967)

4.2. Standardization of processes

4.2.1. Process standardization - its definition and use

As an overall definition of process standardization, Schäfermeyer and Rosenkranz (2011) describes it in the context of business process management as a unification of business processes within an organization together with the included activities. This should make the business less difficult to operate, as well as the way it is communicated, improve collaboration and be a basis for development of performance measurements (Davenport, 2005). All of this with the objective to achieve the processes' goals in terms of time, cost and quality. This means that the objective of process standardization ought to be *“to specify transparent and uniform process activities across the organization or value chain and across firm boundaries”* (Schäfermeyer & Rosenkranz, 2011, p. 3). With this explanation, an explicit way of defining a standardized process is:

”A standardized process is a process that defines a single method of performing a task. Standardization means that all employees will perform a task in the same way on every occasion that the task is carried out.”

(QFinance, n.d, p. n/a)

Despite the modest amount of literature connecting process standardization with purchasing processes, Sánchez-Rodríguez et al (2006), provides a thorough research article on the subject, which also tightly connects to process performance. Apart from standardization of materials⁵, they distinguish standardization of purchasing procedures as being a part of *standardization in purchasing*. Procedure, or process, standardization is by them defined as *“pre-set procedures and reference material for performing normal daily purchasing tasks such as ordering, expediting, selection of suppliers, and receipt and inspection of goods”* (Sánchez-Rodríguez et al, 2006, p. 57).

A distinction between standard processes and standardized processes is be helpful to make at this point. Standard processes have predetermined inputs, are repeated in the same way and yields in beforehand specified outputs. Because of this they are suitable for being standardized, i.e. being defined in an exact way (note that they are not standardized at this point). The process can be designed so that it follows established procedures and process descriptions, and starts and ends with well-understood and specified input and outputs. Along the way activities follow identical scripts so that

⁵ Defined as *“replacement of several materials/components by a single component that has all the functionalities of the materials/components it replaces”* by Sánchez-Rodríguez et al (2006, p. 57).

specified objectives can be realized, however, each activity should be able to be performed in an optimal, in- and output-specified, way every time. (Schäfermeyer & Rosenkranz, 2011)

Standard processes are advantageous to standardize because of their simplicity, but even if the processes are well-known, it is usually implied that more than one method is being used if processes are completed by more than one person, and this affects the consistency and result (Schäfermeyer & Rosenkranz, 2011). Surely, companies want to limit activities that re-invent the wheel and acts uncoordinated with other business processes. Those variations may be decreased with standardized processes. There is, however, a need to find the right balance between standardization and required variation due to specific characteristics, and between centralized control and distributed independence. Variations arise within one or more of the elements surrounding a process (see *Figure 14*), i.e. inputs (e.g. suppliers), guides (e.g. regulations and policies), and enablers (e.g. IT systems). The activity sequence that transforms the inputs into outputs defines the process. If the same output is requested based on different inputs, guides or enablers, again, a standardization potential exists. (Tregear, 2010; Crowden, 2010)

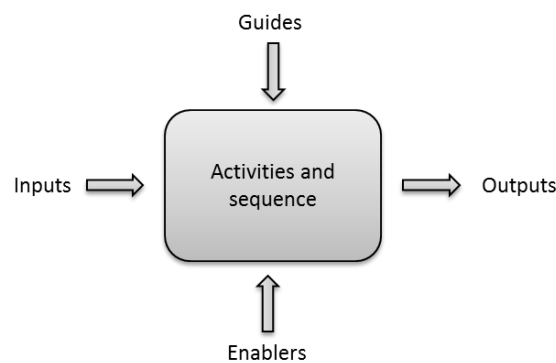


Figure 14. Elements of a process (Source: Tregear, 2010, p. 309)

The variations cause costs for the company that may be difficult to distinguish, and they can take many forms. Examples are customer dissatisfaction (customers expect consistent outcomes), inefficiency, ineffectiveness (the right process must be used), documentation (different documents needed), loss of “best process” (organizational parts working isolated usually imply sub-optimization), increased complexity (organizational such that adds costs and risks to management), IT development and support (process variations require variations in systems), and re-inventing the wheel (double costs for the same outcome). However, process variations may have both costs and benefits and the same factor can be differently valued by different people involved in the process. It is hence evident that companies have to examine the trade-off between costs of standardization and costs of non-standardization. (Tregear, 2010)

“Continued support for unnecessary process variations is a lost opportunity for performance improvement.”

(Tregear, 2010, p. 314-315)

Initially, when standardizing processes a process map need to be created with all ingoing steps. This breaks down the company into key business processes that reveals where standardization is possible. It is thus a requirement to understand why each process is needed. The process mapping is done by gathering information and knowledge from people involved, which may look different to different

persons, both in the way they think it is performed and the way it should be performed. The process map will show that there are parts of the process that are completed differently by different persons, and there has to be a consensus regarding which way is the best and most efficient. This agreed standard way of working should be turned into an operating guideline, which can be used for introducing new people to the systems and as reference for audits, for reviewing performance against standard and for regulatory bodies. In short, it could be said that to standardize a process one needs to map, analyze, measure and document the process in target. Along the way it is important not to make any assumptions. (Crowden, 2010; QFinance, n.d.)

4.2.2. Reasons for standardizing processes

Companies run processes that are interrelated in many ways and the success of any organization often depends on the way this is handled (Crowden, 2010). There are several reasons to why companies pursue standardization of their processes. As mentioned, the communication about how the business is operated is facilitated within the company and it allows smooth handoffs within and across process boundaries (Davenport, 2005). With a standardized process, a company can be more confident about achieving consistent outputs from this process and the complexity of the information systems can be reduced (Tregear, 2010). Apart from this being beneficial for customers and internal customers, as in for example the common interface, standardization enables comparative performance measurements (Crowden, 2010). A standardized process should be run in the most possible efficient way and by this it becomes a potential for cost savings and contributes to an overall success of the company. (Crowden, 2010; Sánchez-Rodríguez et al, 2006)

If a company's operations can be broken down into a number of defined processes, the dependence on individuals' knowledge and expertise can be removed. However, it requires documentation of procedures, standards, work instructions, and guidelines, and this should belong to the business and not to individual employees or groups of employees. It is said that, through standardized processes that have been turned into operating instructions, a company can reach partly a solid base for improvement findings and partly working procedures that should be easy to update when required changes occur. There are economies of scale in a range of different areas, for instance in training, IT development, document control and process improvement. This also holds for the earlier mentioned performance measurements and quality assurances. If standardized processes are followed, the company or the users can also expect an increased productivity, an improved quality and usually lower process overheads. (Crowden, 2010; Tregear, 2010; QFinance, n.d.)

Reconnecting to the research by Sánchez-Rodríguez et al (2006, p. 58), they had a hypothesis stating that "*standardization in purchasing has a positive impact on purchasing performance*". This statement was supported in their research, which means that companies that adopt purchasing standardization (which in that study consisted of both standardization of materials and standardization of procedures) are likely to see increased levels of purchasing performance, as in for instance conformance of purchased materials, accuracy in supplier's deliveries, and meeting material expenditure and inventory performance targets. This result has also been achieved by e.g. Jayram and Vickery (1998).

Purchasing managers can save money through a standardization of purchasing procedures since it enables them to spend more time on non-routine activities (e.g. cost/value analysis, supplier development, and concurrent engineering). Standardization may also increase the accuracy and the

effectiveness of the process, leading to a better purchasing performance. The possibility of errors should be reduced by standardization of processes, as well as it should facilitate finding of the root of problems in the process. Together with this it should also be possible to identify how actions can be taken to implement changes that prevent the error to appear again. (Sánchez-Rodríguez et al, 2006)

In the research it was also concluded that companies' performance levels within purchasing affects the performance level of the overall business, in terms of increasing the competitive levels of returns of assets and sales, market share and production costs (Sánchez-Rodríguez et al, 2006).

“This direct effect of purchasing performance on business performance validates the notion that the improvements in the operating performance of the purchasing function result in cost reductions and increased sales and market share, thereby providing a competitive edge to companies.”

(Sánchez-Rodríguez et al, 2006, p. 62)

This is thus another argument for continuing on the path where purchasing gets more important and strategic within companies. Purchasing managers need to increase this awareness, pointing at the fact that the purchasing function has a strong potential to contribute to a company's financial success and therefore should be involved in the strategic directions of the company. (Trent & Monczka, 1998)

Back to the purchasing standardization, Sánchez-Rodríguez's et al (2006) article also determines that, by the means of purchasing performance, a standardization of purchasing has a positive indirect impact on business performance. However, this effect was small because of the many factors influencing the overall business performance, but still it indicates that there is a relation between standardization in purchasing and business performance and hence, if standardization is fulfilled, there should be an increase in the bottom line of the company. (Sánchez-Rodríguez et al, 2006)

One may wonder if standardization does not have any downsides, and the concept of innovation, or rather lack of innovation, is commonly spoken about in relation to standardization. The argument is that *“work standardization prevents the display of creative and innovative activities, and they are mutually exclusive”* (Kondo, 2000, p. 8). On the contrary, it is said that standards are developed to ensure quality levels, and should be developed not to prevent human creativity. Therefore, standardization is a way to set the minimum required levels of for instance quality, while innovation could be used to refine and improve them. (Kondo, 2000)

Examples of tools for making decisions upon purchasing strategies are portfolio models. Such models give the user, most commonly a company, a chance to standardize the way product groups should be managed. But since it enables the user to form different standardized strategies for different product (or supplier) categories, there is still room for innovation. The categorization within the portfolio models is usually highly subjective which has the benefit of the company being able to form them due to their own specific needs. (Kadre, 2011)

4.3. Purchasing portfolio models

4.3.1. Rise and establishment

Companies, especially large ones, normally have to handle many suppliers, as well as products, that most commonly need to be treated in different ways. The main intention with most portfolio models is to form differentiated, but standardized purchasing and supplier strategies, to handle this issue. ABC-analysis⁶ has been used for a long time as a tool for differentiating less important purchases from more important, or strategic, ones. This is, though, focused on the item's financial value solely and does not take into account aspects like the costs connected to poor quality or different risks (e.g. performance and social). There is also a lack of recommendations on strategic directions connected to different item categories. (Gelderman & van Weele, 2003; 2005)

Purchasing portfolio models assist companies in identifying purchasing strategies that fits specific product categories, especially those regarded more essential to business, from purchasing's perspective (Lee & Drake, 2010; Gelderman & van Weele, 2003). Portfolio models within purchasing have grown in usage, in academia as well as in practice and portfolio analysis have even "*become the dominant approach to what the profession regards as operational professionalism*" (Cox, 1997, see Gelderman & van Weele, 2002, p. 31).

Gelderman (2003)⁷ found that 58 percent of Dutch purchasers who operate in manufacturing and engineering industries use purchasing portfolio analysis in their business. However, this is a weighted average, among large companies the number rises to 80 percent. While most of the companies in the survey used portfolio approaches mainly to develop differentiated purchasing strategies, other important reasons was also to gain insights into suppliers and products, make purchasing cost savings and identify problems and possibilities in purchasing. Another survey made among over 120 companies in the UK within different sectors, showed that portfolio models was the second most used out of 42 purchasing and supply tools, used by 33 percent (vendor rating was the most used and enterprise resource planning systems the third) (Cox & Watson, 2004).

In the early eighties, Kraljic suggested a portfolio approach that became commonly used and is still recommended today. The model was presented in the article *Purchasing must become supply management – How managers can guard against materials disruptions by formulating a strategy for supply*, published in *Harvard Business Review* in 1983 (Kraljic, 1983). This was the first portfolio approach that was created for, and adapted to, purchasing and supply management. As the title hints, his advice for companies and managers was to gain a more holistic view of their processes, and specifically the supply chain, wherein devastating interruptions of supply could be avoided and they should be able to handle the technological and economic dynamics. With this in mind Kraljic developed a useful portfolio approach customized to come up with complete supply strategy. (Gelderman & van Weele, 2005)

Critiques and disadvantages of the model have been put into light during the years, and this will be presented later on. However, Kraljic's portfolio approach has also been mentioned as "*a major*

⁶ For a description of ABC-analysis, see for instance Flores and Whybark (1988).

⁷ For a thorough and extensive description of portfolio models, in general and within different management disciplines, see Gelderman (2003).

breakthrough in the development of professional purchasing”, and also “*the most important single diagnostic and prescriptive tool available to purchasing and supply management*” (Syson, 1992, see Gelderman & van Weele, 2005, p. 21). The basic ideas of the approach have been used several times for development of comparable portfolio models (e.g. Bensaou (1999), Gelderman (2003), Olsen & Ellram (1997), Lee & Drake (2010)), but the original matrix (model) still remains the foundation for many companies across diverse industries that want to create portfolio based purchasing strategies. It has thus been concluded that Kraljic’s matrix has become a standard in this field, as well as in textbooks on purchasing and supply management (Gelderman & van Weele, 2003; 2005).

4.3.2. Kraljic’s portfolio model

The underlying idea of Kraljic’s portfolio model is that different strategies are needed towards the supply markets, due to the fact that suppliers are of different importance or interest to a company (van Weele, 2010). This implies that the different strategies should encompass the issue of power balance between the company and its suppliers in suitable ways according to the importance of the relationship and the purchased items (Gelderman & van Weele, 2002).

A first step in forming commodity strategies is to analyze the supplier base versus the purchasing spend (i.e. a Pareto analysis). This usually shows that the 20-80-rule holds, that is that twenty percent of the items, and also the suppliers, represent eighty percent of the purchasing turnover. The method is used to understand where the high-value spends are, which reveals where to focus the limited resources. The next step is where Kraljic’s portfolio approach applies, which refines this division. (Cox et al, 2005)

There are two basic variables that determine the types of strategies a company needs, partly to achieve the preferred power balance in relation to suppliers, and partly to minimize the risk to an adequate level. These are:

- The strategic importance of purchasing; how large the value addition is, the cost of materials, the impact on profitability, volume purchased or percentage of the total purchase cost. It may also be indicated as the impact on the bottom line for the overall company. The more money involved in purchasing, the higher the effect on the bottom line.
- The complexity of the supply market, i.e. the supply risk. This may be determined by the product availability, supplier availability, supplier changing costs, market structure, materials or items substitution, market entry barriers, logistics costs and so on.

(Kraljic, 1983)

With Kraljic’s (1983) framework, companies are said to be able to develop strategies to “*minimize their supply vulnerability and make the most of their potential buying power*”. The approach is also believed to be an aid in collecting corporate data and marketing data, forecasting supply scenarios, and finding available purchasing choices. The content of *Table 5* is extracted from van Weele (2010) and outlines examples of criteria to look at when evaluating the strategic importance and the supply risk.

Standardizing purchasing processes

Table 5. Examples of criteria for purchasing portfolio (Source: van Weele, 2010, p. 196)

Impact on bottom line	Supply risk
<ul style="list-style-type: none"> • Volume compared to total purchasing volume • Products share in overall cost price • Products contribution to total company margin • Cost savings potential through: <ul style="list-style-type: none"> - Competitive bidding - Volume agreements • Price elasticity • Rebate and bonus scheme 	<ul style="list-style-type: none"> • Branded product versus standardized product • Patent (licensed products) • Availability of substitutes • Specific quality and logistics requirements (JIT) • Degree to which suppliers are prescribed by our company's customers • Supplier's share in buyer's purchasing turnover • Market structure: free competition versus monopoly • Market situation: buyer's versus supplier's market • Supplier production capacity utilization • Supplier's financial position • Supplier's switching costs

By using the combination of supply risk and purchasing's impact on the financial results, and valuing purchased items as high or low according to those, items can be arranged into four different categories in a two-dimensional matrix, namely strategic, bottleneck, leverage and non-critical (or routine) (see *Figure 15*). Items that are grouped together will get a certain strategic approach according to its strategic requirements and relevance. (Kraljic, 1983)

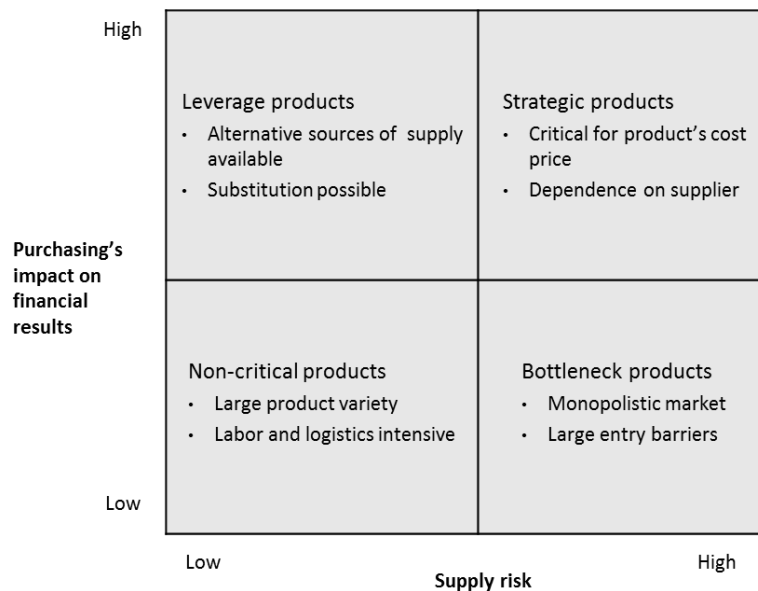


Figure 15. The product portfolio matrix (Source: van Weele, 2010, p. 197)

The product groups

As the name suggests, non-critical products do not cause many problems in the supply chain. They are usually easy to handle and have a low strategic importance. Included items are mostly inventory items that have a large supplier base and the single item cost is usually low. The main issue with non-critical products is that their handling costs are higher than their product value. The requirements for this group are to have an efficient purchasing process and optimize the inventory, as well as thinking about

product standardization, order volumes, and reducing the number of suppliers. (Olsen & Ellram, 1997; Gelderman & van Weele, 2002)

The supplier base for the bottleneck product category is usually limited to one supplier and there is, hence, a relatively high supply risk. This kind of purchases has a low strategic importance but they can be difficult to manage: the product value is low in monetary terms and examples are equipment spare parts (Olsen & Ellram, 1997). One issue with the bottleneck products is the dominant role the supplier usually has towards the buyer and this can result in bad service, as in long delivery times, and high prices. To ensure the right volumes companies should think about supplier control, securing inventories and creating backup plans. (Gelderman & van Weele, 2002)

The leverage products are relatively easy to manage, but do also have a strategic importance to the company (Olsen & Ellram, 1997). They are usually bought in large volumes and at standard qualities, but their value share of the end product is high, hence, changes in price implies a strong influence in the cost price of the end product. Still, they may be purchased from several suppliers and the cost of switching suppliers is low. This indicates that there is an opportunity for the company to focus on e.g. tendering, target pricing and substitution of products and show its full purchasing power. (Gelderman & van Weele, 2002; Gelderman, 2003)

The strategic products are both, as the name tells, strategically important, as well as difficult to manage (Olsen & Ellram, 1997). This group includes high-tech products that require high specifications before purchase and usually also an intensive collaboration between buyer and supplier (van Weele, 2010). The supplier base is seen as singular, at least in the short term, since the cost of changing supplier will incur high costs. The share of the end products' cost price is normally large. Since the strategic products are of such importance to the company, the portfolio model recommends a further division and analysis of these to form the right strategies. (Gelderman & van Weele, 2002)

The corresponding strategies

Since the non-critical products are frequently ordered, are easy to manage and incur high logistics costs, the strategies should aim at reducing the transaction costs and the logistic and administrative complexity, this through an efficient process (Lee & Drake, 2010). The company has to develop efficient routines for ordering and administration and engage in category management. This is preferably done together with suppliers and preferably in some kind of e-procurement solution. This may for instance be an electronically based catalogue wherein employees with the purchasing need can order straight from suppliers, preselected together with the purchasing department. Other policies that are relevant for this group are standardization of products, create long-going or systematic contracts for certain item groups, optimize order volumes and inventory levels, and reducing the number of suppliers (also through category management). The relationships with the suppliers are often short-term and should basically manage themselves and the focus for the non-critical products should be put on reducing the administrative costs says Olsen and Ellram (1997). (Gelderman & van Weele, 2005; Sarkar & Mohapatra, 2006)

The strategies for the bottleneck items should be concentrated on securing a continuity of supply, this may be at an additional cost but the cost of standing there without such products is usually higher (Gelderman & van Weele, 2005). As mentioned earlier, activities for bottleneck products are optimizing safety stocks, creating back-up plans and also some kind of supplier control (Sarkar &

Mohapatra, 2006). A more effective way of handling the purchases should be sought after, for instance through standardization or finding substitutes (Olsen & Ellram, 1997). Reducing the dependence towards suppliers can also be done by analyzing the market for other suppliers and develop alternative products (Sarkar & Mohapatra, 2006). Conducting a risk analysis to point out the most essential products, in short-, middle-, and long-term, can help the company form contingency plans which should prepare for any risk becoming reality (Gelderman & van Weele, 2005). Relationships should focus on concurrent engineering and the supplier could also be involved in value analysis in order to lower operational costs (Olsen & Ellram, 1997).

The strategy for leverage products may focus on identifying the product's particular value added as well as its volume, to be able to lower the materials costs. Competitive bidding is the situation when a buyer collects bids from a range of suppliers, which creates competition among the suppliers. This fits this group of items since the items, as well as the suppliers, are interchangeable. It is in this category the company can exploit their full purchasing power. Since small price changes will have a large impact on the financial results it is important to continuously examine the market, which also results in that new suppliers get involved, which opposes price agreements among the current suppliers. The relationships with suppliers in the leverage group should be considered to strengthen, without putting considerable resources into it. This may for instance be done by giving higher volumes to the suppliers. The goal should also be to establish mutual respect that can evolve into pre-established system or corporate contracting (that may be utilized by any individual business unit) with preferred suppliers, that gives the buyer low total cost, since the spend value is high in this category (Olsen & Ellram, 1997). (Gelderman, 2003; Lee & Drake, 2010)

The strategic products call for a close relationship between the buyer and the supplier, since they are critical both for the everyday production and the financial results, usually for both parties. It should focus on early supplier involvement, which could mean, or lead to, a joint development of the products. As these products have a high supply risk and the buyer is dependent on the supplier, focus should be put into keeping long-term values and lowering disadvantageous performance costs. The relationships usually also focus on pre-planning costs, setting up targets within operational improvement and overall process improvement, quality, and product development. It is dependent upon consistent information sharing and visits at sites. (Gelderman & van Weele, 2005; Olsen & Ellram, 1997; Lee & Drake, 2010)

A compilation of the four product categories and their corresponding strategies can be found in *Figure 16*.

4. Theoretical framework

	Strategic products	Leverage products	Bottleneck products	Non-critical products
Main tasks and activities	Create mutual commitment in long term relationship Accurate demand forecast Supply risk analysis Careful supplier selection 'Should cost' analysis 'Rolling' materials schedules Effective change order procedure Vendor rating Contingency planning	Obtain 'best deal' for short term Explore purchasing power Improve product/market knowledge Search for alternative products / suppliers Reallocate purchasing volumes over suppliers Optimize order volumes 'Target' pricing	Secure short and long term supply Reduce supply risk Accurate forecast of future requirements Supply risk analysis Determine ranking in supplier's client list Develop preventative measures (e.g. buffer stock, consigned stock) Search for alternative products / suppliers	Reduce logistic complexity Improve operational efficiency Reduce number of suppliers Subcontract per product group Standardize product assortment Design effective internal order delivery and invoicing procedures Delegate order handling to internal user
Suitable strategy	Partnership	Competitive bidding	Secure supply	Category management and e-procurement solutions
Required information	Highly detailed market data Long-term supply and demand trend information Good competitive intelligence Industry cost curves	Good market data Short-to-medium term demand planning Accurate vendor data Price/transport rate forecasts	Medium-term supply/demand forecast Very good market data Inventory costs Maintenance plans	Good market overview Short-term demand forecast Economic order quantity inventory levels
Decision level	Top level Cross functional approach	Top/medium level Purchasing	High level Purchasing Cross functional approach	Low level Purchasing Cross functional approach

Figure 16. The product group's characteristics (Ad. from van Weele, 2010, p. 201; Cox et al, 2004, p. n/a)

As mentioned earlier, strategic product should be investigated further to be able to develop comprehensive strategies. Although very interesting, this theory is too advanced for the purpose of this project. In short it can be said that the further investigation is done by looking at the power balance between the buyer and the supplier, and position the products in three different segments which correspond to three different purchasing strategies. (van Weele, 2010)

The three different suggested approaches denote differences in the strategies in terms of for instance volume, price, supplier selection, material substitution, and inventory policy. In cases where the supplier is valued as stronger than the company and diversification is suggested, the company should focus fragmented volumes to a single supplier, establish supply contracts that cover the full volume, and also accept the higher prices that this may incur. Such an approach is likely to bring dependence towards the supplier, and therefore companies should, however, also seek other suppliers to reduce the

long-term risk. When the company's strength instead is larger than the suppliers', volumes can be spread over a number of suppliers and for instance gain price advantages. (Kraljic, 1983)

4.3.3. Critique against Kraljic's portfolio model

Purchasing portfolio models have been criticized in common, but the main concerns are distinguishable to be measurement issues and related (Gelderman & van Weele, 2005), i.e. the:

- Selection of variables and its measurement
- Operationalization of variables and the lines of demarcation of them
- Simplicity of recommendations
- Disregarding of the supplier side

It is argued that one cannot know whether the variables used are the most appropriate ones and how the weighting of those factors should take place. Decisions that are based on portfolio models have been proven to be sensitive to dimension choices, factors and its weights. The next measurement issue concerns how to actually operationalize the meaning of *profit impact* and *supply risk*, and more importantly, how can one decide what is *high* and *low* and where the boundary between them may be drawn. There are no calculating rules for determining if a purchase is highly important or not, and this holds for other dimensions as well. This seems to be the weak spot of portfolio models and imply that the validation of the measures is limited, and there is a risk that the variables are not accurate representations of the dimensions they are intended to measure. The weighing of the factors is an important part of the implementation process and with the lack of a standardized way to evaluate impacts and risks it will be highly subjective. It is thus vital for decision-makers to agree upon these factors' importance. Problems of differentiating the different categories from each other may lead to an arbitrary classification of the products and in extension the connected recommendations. These should, hence, be applied with reserve, and this the more the closer a product is positioned to the boundary with another category. (Gelderman & van Weele, 2002; 2003; 2005; Lee & Drake, 2010; Gelderman, 2003)

Another argument against portfolio models is that strategies cannot be construed from any analysis that is based only on the two dimensions, i.e. that recommendations cannot be gathered from such simple investigation. Business decisions are in general more complex than that but still many portfolio models do not take more dimension into account. (Gelderman & van Weele, 2003; 2005)

The last point from above deals with a dimension that, if considered in a wider perspective, would increase the complexity of Kraljic's model, and that is the disregard of the supplier side in portfolio models. If a company positions a product as strategic, for instance, it does not mean that the supplier sees it the same way. Knowledge of the interdependence between buyer and supplier is important to avoid misunderstandings and disappointment, and it is obvious that for instance a partnership strategy is only possible if this is the intent of both sides.⁸ Portfolio models also lead to strategies that are independent of each other and accordingly also the items placed in different quadrants in the matrix. It

⁸ A help in reaching this is the *Dutch windmill* model, which can be used as an extension to purchasing portfolio models and mirrors the buyer's view to the supplier's view. See for instance van Weele (2010).

is argued that this implies that the models, from a network perspective, do not capture all facets required in a buyer-supplier relationship. (Gelderman & van Weele, 2003; 2005, van Weele, 2010)

The support and arguments for portfolio models are primarily found in theoretical investigations and reports from case studies are limited. To this fact, however, should be noticed that this does not mean that the practical use is as limited and also that the critique of portfolio models, including Kraljic's, does not come from experience from practitioners. In contrast, users of portfolio models have, through experience, replicated to the criticism saying that there cannot be a simple and standardized way of applying portfolio models since it is complex and requires critical thinking from the purchasing function. (Gelderman & van Weele, 2003; 2005)

It is clear that purchasing portfolio models have contributed to the recognition of possibilities within purchasing and the move towards a more strategic role of this function within companies. Hence, portfolio models and analysis should be seen as important tools, mainly when it comes to visualizing and discussing options and potentials in companywide value-adding. The fact that management is forced to critically evaluate their suppliers, markets and purchasing activities due to the lack of objective and standardized measures could even be considered as beneficial. The conclusion is that, despite the measurement issues, the most important benefit of the Kraljic portfolio model - that the use and adaption to it lead to a better understanding of the strategic issues at hand - speaks in favor for it. (Gelderman & van Weele, 2002: 2003)

4.4. Purchasing efficiency

4.4.1. Defining purchasing efficiency

To reveal the characteristics of purchasing efficiency it is necessary to take one step back and look at purchasing performance. According to van Weele (2010) (and e.g. Kakwezi and Nyeko, (2010)), purchasing performance is the combination of purchasing effectiveness and purchasing efficiency and their outcomes.

These concepts may in turn be defined as:

Purchasing effectiveness; “[...] *the extent to which, by choosing a certain course of action, a previously established goal or standard is being met*”,

Purchasing efficiency; “[...] *the extent to which the purchasing function is able to realize its predetermined goals at the sacrifice of a minimum of the company's resources, i.e. costs*”.

(van Weele, 2010, p. 305)

In general terms, effectiveness is usually referred to as ‘doing the right things’, while efficiency should be ‘doing things right’ (Kakwezi & Nyeko, 2010). Jander and Seshadri (2001) defines efficiency as the ratio between purchasing inputs and outputs which can be measured in terms of cost reductions and order processing times. A system for performance measurement may focus on either one or both performance terms (Jander & Seshadri, 2001). Efficiency and effectiveness signify different capabilities and this leaves a trade-off between the two. Companies that are more focused on efficiency lean towards decision-making based on costs, investment pay-backs and productivity, while

effectiveness-focused ones make decisions built upon quality and value. Hence, it is important to find the right balance between effectiveness and efficiency, which is determined by e.g. line of business and chosen strategies. (Hart, n.d.)

4.4.2. Measuring purchasing efficiency

As of today, no standardized procedures have been developed for measuring the performance of purchasing, and the question whether it is possible have not been answered. Although, in company specific approaches it is measured since there is so much to gain, e.g. gathering information for analysis and better decision-making, improvement of inter-department communication, increase of visibility (for instance through consistent reporting of actual versus planned results), and higher motivation among employees at different positions through for example goal setting. These reasons make it relevant for companies to understand which of all possible purchasing strategies are efficient, effective, and can bring about a (higher) added value from the purchasing unit to the company as a whole. (Kakwezi & Nyeko, 2010; Jander & Seshadri, 2001)

Apart from common meanings of purchasing efficiency, purchasing performance etcetera, there also lays a problem in the lack of formal objectives and performance standards. Within the purchasing function it is common not to have objectives and strategies clearly stated, and this makes it problematic to evaluate the performance in an objective manner. It can also be difficult to reach an accuracy of the measures, i.e. know that what is aimed measuring really is measured, since, with the supply chain perspective, purchasing is not an isolated function. Instead it is dependent on many other activities, usually intangible ones that are hard to identify, which are incorporated in the function's results. (van Weele, 2010)

However, it is still possible to make a further division of purchasing performance from efficiency and effectiveness into more explicit areas. Those are areas wherein to put efforts for improving the purchasing efficiency (and effectiveness). They can be seen in *Figure 17*, which also shows that measures can be both financial and non-financial. (van Weele, 2010)

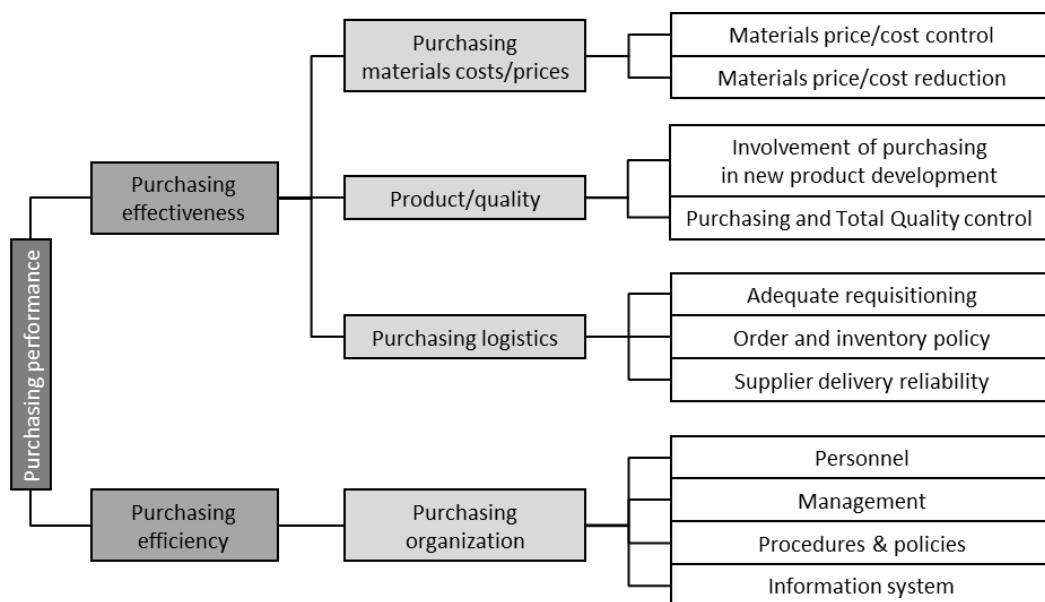


Figure 17. Key areas of purchasing performance measurement (Source: van Weele, 2010, p. 306)

Among the four dimensions in *Figure 17* – price/cost, product/quality, logistics, and organizational – one can see that it is the organizational factors that determines the purchasing efficiency. More explicitly, it relates to how the purchasing function and processes are organized, how systems are utilized, and which policies, procedures and guidelines are in place and are used (van Weele, 2010). The dimension takes account of the most important resources needed to achieve the purchasing function's goals and objectives. These are:

- Purchasing staff: the background, knowledge and competence, hierarchical level, training and development of the employees and all related costs,
- Purchasing management: the way of managing the department; the quality and availability of strategies, policies, procedures and action plans, as well as management style and communication structure,
- Purchasing procedures and guidelines: the working instructions for employees and suppliers, as well as its availability, that should guarantee the efficiency,
- Purchasing information systems: information systems should support the purchasing department and also other employees in daily undertakings and this point relates to the efforts made to improve the systems. The ISs should also be a generator of required management information regarding purchasing activities and performance.
(van Weele, 2010)

4.4.3. Improving purchasing efficiency

The improvement of the purchasing efficiency of a company is highly connected to the measurement of it since measurements are the way to be certain about an improvement (van Weele, 2010; Accenture, 2009). The way a company aims at improving its purchasing efficiency is dependent on, or should be, the overall business strategies (van Weele, 2010). Accenture (2009) made a survey with over 220 purchasing executives in different continents of the world and compared the actions taken by different companies to increase their purchasing performance. The result showed that there are certain actions taken that diverse what they call the procurement masters from the procurement laggards (Accenture, 2009). Examples of such “best practices” were that masters were able to manage the buying-channel execution and the purchasing operations efficiently, they segmented their suppliers to form different relationships with them for example to guarantee supply at the right cost, they had a category management structure that was both centrally led and had a dynamic structure, and they took a strategic approach to category planning (*ibid.*). It was also found that it is important to use technology to make the purchasing more efficient, transparent and internally compatible (*ibid.*). All of these activities or practices can, in one way or another, be connected to the measurement areas of efficiency described above.

Reconnecting to the section above on standardizing processes, it should be said that many researchers have pointed at the connection between process standardization and improved efficiency, e.g. Beimborn et al (2009), Schäfermeyer & Rosenkranz (2011), Münstermann et al, (2010), and Sánchez-Rodríguez et al (2006). Beimborn et al (2009) showed that process standardization positively affects process performance, which leads to both a higher process efficiency and a better process quality, for example by identifying best practices. Schäfermeyer and Rosenkranz (2011) also states that process standardization leads to a range of benefits and opportunities, With efficiency being a part, it will

Standardizing purchasing processes

together with transparency, controllability, quality, and decreased risks, lead to increased profit, cost savings, and better operative process performance.

5. The case company

The chapter starts with a section about the items, first describing existing categories at the case company and then how production process equipment items are handled at Höganäs and how they can be categorized. Then a description of the steps included in the purchasing process of PPE items is provided. Lastly, an example of PPE purchasing is provided.

5.1. Purchased items

5.1.1. Established groups of all items at the case company

Höganäs has an established classification of all items purchased; product groups and item groups. The operations manager for operations at one of the plants, Bolin, states that the product groups amounts to five and are named:

- *Consumables*, which have the fastest turnover;
- *Nonspecific*, which is construction materials;
- *Several*, which includes items for several equipment, including spare parts;
- *Unique*, which is specific items for specific machines; and
- *Insurance spare parts*, which can be used for several machines but are still less commonly used than spare parts in the *Several* group.

This division is not used in the daily operative work and is mainly a way for e.g. the purchasing department and the warehouse to separate financial matters like depreciations.

To be able to buy an item it has to be connected to a specific item number. Thus, each and every (different) item purchased at Höganäs has a unique item number and the amount of item numbers reaches around 40 000, says the engineering manager, Westman. A share of 16 000 item numbers belongs to items that are stock-kept at the warehouse, and a part of those stock-kept items are spare parts, see *Figure 18*. A large amount of items are hence purchased straight from the suppliers, including a share of spare parts. (Westman, 2012)

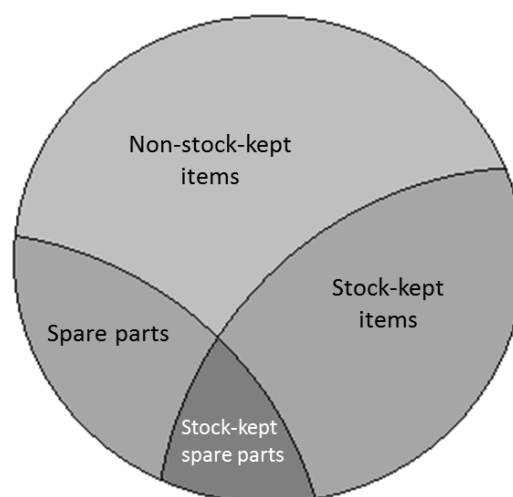


Figure 18. Schematic illustration of all items at Höganäs

All the items are grouped into different item groups according to their characteristics. Those item groups are used by all departments and facilities. But it is not as easy as just this; there are also five different levels of item groups. It is to the most specific group (i.e. unique items) that the unique item numbers are connected. For an illustration on the different levels, see *Figure 19*. When searching for an item in the ERP-system, for instance when an item is to be (re-)purchased, it is through those levels of groups one navigates. The four groups on the highest level (Level 1) are *electric materials*, *consumable materials*, *machine parts*, and *hours* (meaning services). Examples of groups from Level 2 are *automations*, *transmissions* and *gaskets*. Any explicit explanation to why Level 2 and Level 3 have the same amount of groups cannot be provided, but is assumed to be a result of going from an old system to this newer (“*some years old*”) system of structure. (Westman, 2012; Bolin, 2012)

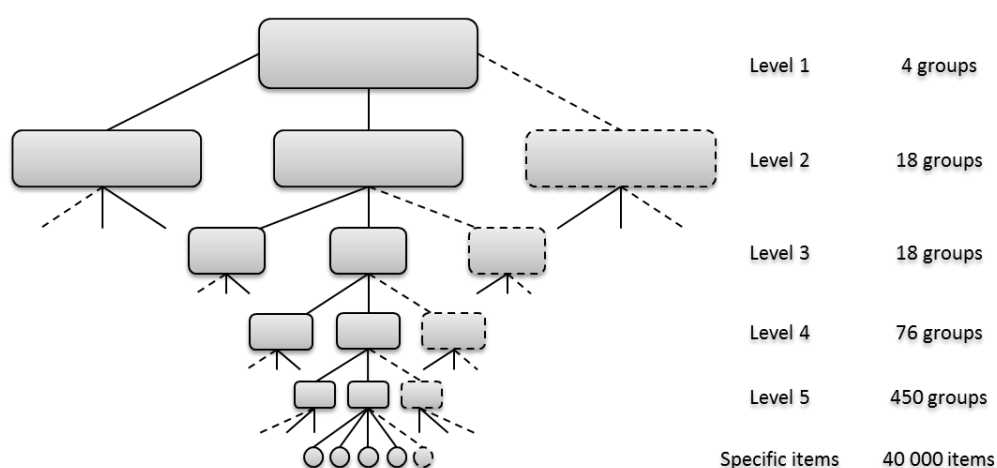


Figure 19. Levels of the item groups down to the specific items

As mentioned earlier, an item number must be connected to each purchase and this can be found by finding the specific item if it has been purchased before. But it is not always easy to find the right item in the system and it requires time as well, and naturally, for entirely new items, item numbers do not exist at all. For that purpose, Höganäs uses what they call *dummies* to simplify the procedure of connecting an item number to a purchase, tells the group of managers present at the first workshop (Westman et al, 2012). Dummies are groups of items but are unclassified and cannot be set equal to any of the specified item groups (Westman, 2012). 28 dummy groups exist and they have been arbitrarily set to include either whole item groups or parts of item groups and also at different levels (*ibid.*). They are not connected to specific suppliers or prices, states the purchasers Olsson and Palmquist.

The dummies often come in question for the PPE purchases since these are items that usually do not have a specific item number established at the company. The chosen dummy number is then connected to the purchase, as long as it is in the purchasing process. The choice of item group by the buyer is very arbitrary and personal, and often the group *consumables in general* is chosen without closer consideration, which means that the purchasing department cannot gather statistics of specific items. (Olsson & Palmquist, 2012)

5.1.2. The warehouse – stock-kept items

The warehouse that is located on-site in Höganäs is used as an internal supplier of items mainly used for maintenance and operations but sometimes also for development projects, says the manager of production supplies, Älgliid, also called the warehouse manager. Each and every item, small or large, goes through the warehouse out to the different facilities or departments. It contains items with a “rather high” value that have 16 000 different item numbers registered in the ERP-system as mentioned above. When items are needed in the production, people come to the warehouse to collect them, through warehouse personnel that register the decrease in inventory level and to which cost center it should be located. The inventory levels are controlled through typical (R,Q)-policies⁹, and are stock-taken once a year. Each item is handled in the same way, whether it is bolts and nuts or expensive engines. (Älgliid, 2012)

Planners at each facility handle the decisions on which items that should be stock-kept at the warehouse, especially important are the spare parts. The warehouse manager then assigns item numbers to the new items (Bolin, 2012). Keeping every item at the warehouse at sufficient inventory levels is an issue for the warehouse manager and should never, if everything goes according to plans, affect any other department or plant (Älgliid, 2012). Meaning, with the warehouse manager having the purchasing responsibility, it should never be an issue for e.g. the technical department to purchase new items if a stock-kept item that goes out of stock is needed (*ibid.*).

The warehouse was earlier organized as a sub-division to the production and was then one of the areas that from the purchasing department had a delegated responsibility for the whole purchasing process in the daily and operational work (Älgliid, 2012; Management system, 2010). This means that the purchasing department was never a part of the process, and that even the purchase orders to the suppliers were written by the warehouse division itself (Älgliid, 2012). According to the Management system (2010), it was, and is, also a task for the responsible function (with the delegated responsibility) to perform supplier evaluations in cases where products are impacting quality. However, today the warehouse is organized under the purchasing department, which means that the purchasing procedures are no longer delegated and the warehouse manager is a purchaser, but the handling of purchases at the warehouse is still the same (Molin, 2012).

The purchasing contracts for the warehouse items reaches over long time periods, and their prices are generally adjusted once a year. If a new contract is to be negotiated, the company usually groups items into groups of 200 to 250 different items and sends out requests for quotations on these. Around three suppliers are asked to give their proposals wherein availability and flexibility, rather than price, is the most important factor, since standing without a certain item can be more expensive to the company. The number of frequently used suppliers amounts to 30 to 50. (Älgliid, 2012)

⁹ An (R,Q)-policy is an ordering policy, i.e. a way to calculate and control the inventory reorder points and batch quantities. See for instance Axsäter (2006) on this.

5.1.3. Possible groupings of production process equipment items

A division based on item type

With the collection of information at Höganäs, a division of the production process equipment was suggested by the manager mechanical engineering, Windén, and it was later discussed at the second workshop (referred to as Molin et al (2012)). In that division, four groups were developed with the following names: *articles*, *specific parts*, *manufacturing parts* and *special machines*. This is thus the definitions from a group of managers involved in the project, and the categorization was made within the project only and is therefore not established at the case company. The item categories are outlined with characteristics in *Figure 20*.

	Special machines	Manufacturing parts	Specific parts	Articles
Characteristics	Very specific for Höganäs Produced at order Not stock-kept External and internal development High specification level Sole-sourced	Internal item numbers Have drawings or other specifications Simple to manufacture Many suppliers can be found	Internal item numbers External item numbers Specific for Höganäs Usually a standard part for the suppliers Single-sourced	Internal item numbers External item numbers Many suppliers available Multi-sourcing possible
Examples	Control systems, mills, packing machines	Processed sheet metal, machined components	Pumps, electric motors, analysis instruments, regulators	Ball bearings, bolts and nuts

Figure 20. PPE purchases grouped according to type (Ad. from Windén, 2012; Molin et al, 2012)

Articles have internal item numbers but they also have external numbers and can be found in suppliers' catalogues. Examples of items in this category are ball bearings and bolts and nuts. There is a possibility of using multi-sourcing, since there are a lot of suppliers that are able to supply the company with the same items and usually at an equal quality (Molin et al, 2012). The reason to why those items are considered technical and as production process equipment even though they are simple in for instance construction is that e.g. a bolt head have specific requirements in e.g. composition and strength, which is specified by a person with a technical competence in the area and according to its usage (Westman, 2012).

Specific parts are specific for Höganäs, but they still have external numbers and can hence be found in suppliers' catalogues. They also have internal item numbers. The items are standard parts for the suppliers but the choice of suppliers is however more investigated since they for instance usually deliver different quality (and service) and Höganäs has to get the exact specified characteristics of the specific parts. The company primarily uses single-sourcing for those items. Examples of items are pumps, electric motors, analysis instruments and regulators. (Windén, 2012; Molin et al, 2012)

The category named manufacturing parts contains internal Höganäs items. They all have drawings or another specification, created by Höganäs (Windén, 2012). Still, many suppliers can be found and with

the specifications stated it should not be difficult to manufacture them. Examples in this group are processed sheet metal and machined components (Molin et al, 2012).

Special machines are even more critical for Högånäs than the specific parts, i.e. the specification level is very high and, as the names tell, they are usually whole machines instead of parts (Windén, 2012). They are produced at order and are never stock-kept, and they require development and man-hours by the supplier (*ibid.*). There is a high level of confidentiality between Högånäs and the supplier, and those items are virtually sole-sourced (Molin et al, 2012).

A division based on requested function

Apart from the described division of the PPE purchases, they can also be divided into what kind of function the purchased item should have. This is also the manager mechanical engineering’s spontaneous division and it has been justified by the workshop group of managers as an appropriate way of thinking when conducting a purchase. Note that it is neither established at the company, nor documented anywhere. The different functions requested from the purchased items are: a *replacement of an existing function*, a *better function*, a *new function* and an *unknown function*. The function division may be further divided into the different types of items that constitute PPE purchases as described earlier. A clarification on this can be seen in *Figure 21*.

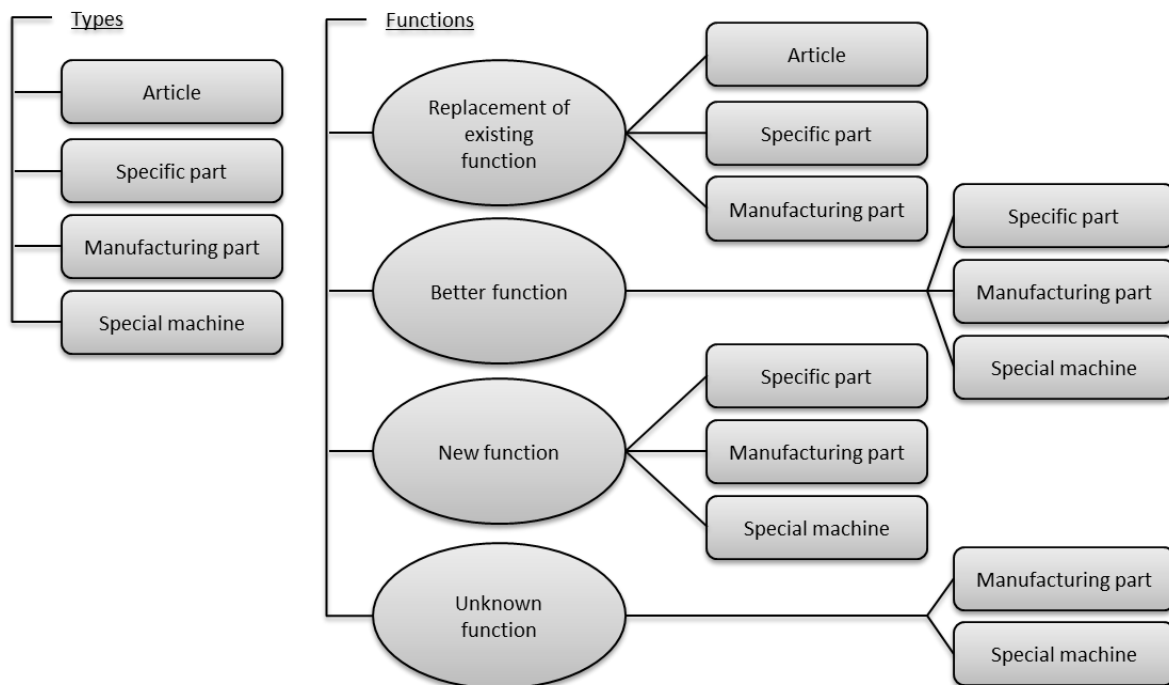


Figure 21. Illustration of the function grouping (Ad. from Windén, 2012; Molin et al, 2012)

When a replacement of an existing function is needed, the specifications are already well-known and usually already exist in printed form (in some cases only in old purchasing orders). Purchasing of a better function means that the same function is needed, but for some reason it has to become better; the item might for instance be needed to improve a part of the production process. When a new function is required, the buyer knows about the need and the desired outcome of the item or machine. The function itself is new to the company, although it is well-understood, or at least the technical

knowledge needed to understand the new functionality and construct the function exists within the company. Lastly, the unknown function exists when only the objective of the function is known. How the need is supposed to be fulfilled is not known and this is usually solved and developed together with a supplier. (Windén, 2012)

5.2. The purchasing process

5.2.1. Step by step

In this section the purchasing process of PPE items is gone through. It should be emphasized that the following illustrations were compiled during the mentioned workshops, and even though the activities are done in this way in practice; it has never been documented or illustrated for PPE items before. The process shown in *Figure 22* is an illustration of the purchasing process for PPE items when all purchasing activities are required, i.e. it is the longest possible purchasing process. It can be shorter when for instance the case company should buy a simple item that has been bought many times before, and for example the contracts or suppliers are not up for discussion. When the purchase takes the form of an internal order, which happens with items that are stock-kept on-site, the process is reduced to the one shown in *Figure 23*. Both *Figure 22* and *Figure 23* introduce numberings that are used in the following when describing the company's purchasing process phases.

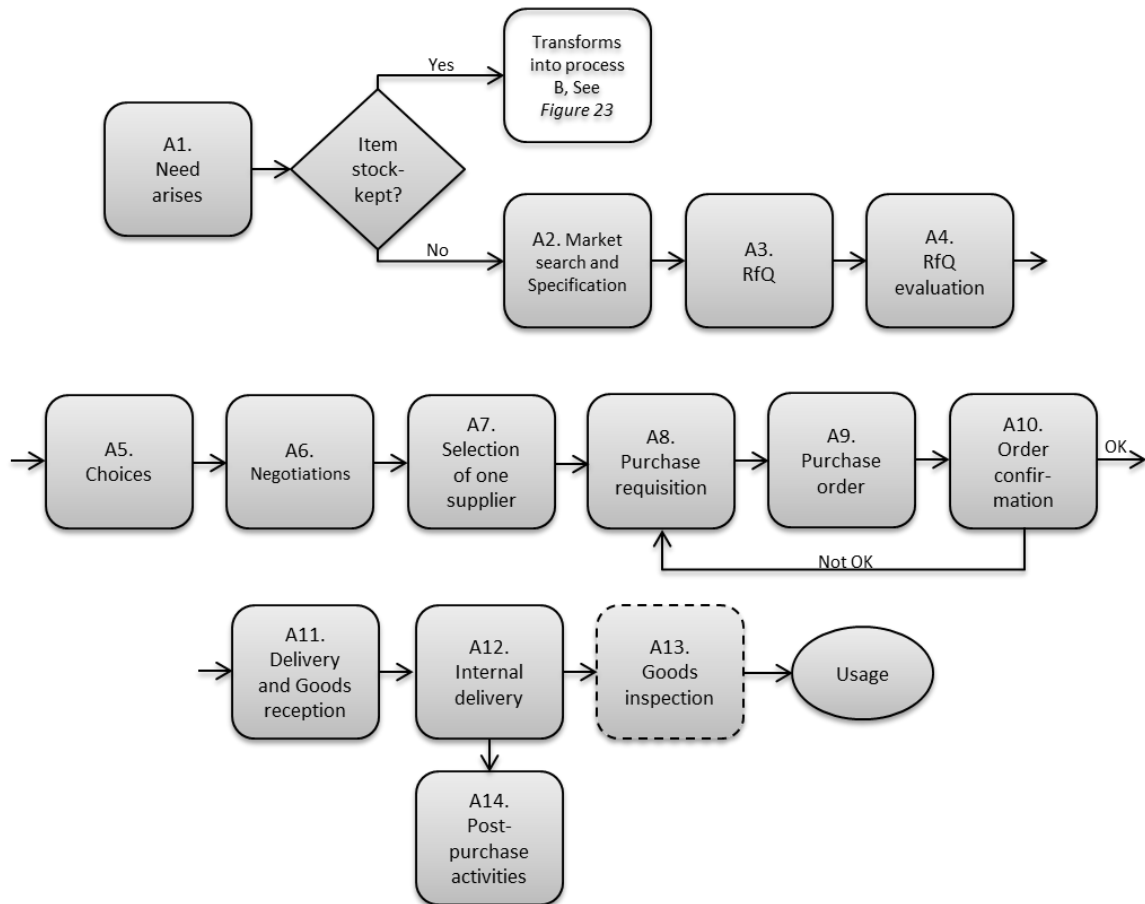


Figure 22. The purchasing process of production process equipment including all possible activities

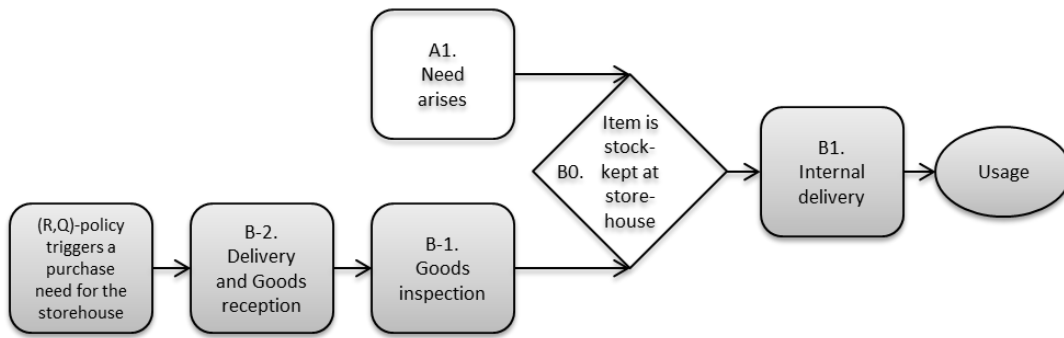


Figure 23. The purchasing process of stock-kept production process equipment

A1 A need arises

The arising need for a purchase has different sources in accordance with the different purchase types, functions or situations described above. The large investments, i.e. large purchases in terms of money, done to improve the production in any way may arise from for instance a necessity to modernize the facility or improve capacity (Löfgren, 2012). The needs for the simplest purchases arise almost every day in the maintenance or operations and may stem from small things like a change of a screw somewhere (*ibid.*).

The first thing to do when a need arises is to look whether it is stock-kept at the local warehouse or not. That an item is stock-kept is usually the case with articles and specific parts that are commonly used, while many manufacturing parts, and certainly the special machines, are not stock-kept. For some items it is evident for the buyer that they are not stock-kept, but in cases when the buyer does not know, the ERP-system should be used to search for the item. A difficulty that lies within the searching of an item is that the naming of the items is not consistent or uniform. It might be that, for instance, one item can be named both “cylinder, pneumatic” and “pneumatic cylinder”. (Westman et al, 2012)

Sometimes it happens that items are bought straight from a supplier by the buyer although it is stock-kept. To its longest extent this may imply that items at the warehouse may not be used within its shelf life and has to be discarded when they get too old, instead of being used when they could have been (any explicit data on this does however not exist). (Älgliid, 2012)

B0 Item is stock-kept

If the needed item is stock-kept it will be internally purchased, which corresponds to the process named *B* (Figure 23). The cost for those items is imposed to the specific project or department when they are purchased from the warehouse (Westman et al, 2012).

A2 State specifications and Search the external market

To be able to state the specifications the buyer has to know if there are any company standards, specifically electrical and mechanical such, for the item that is needed and if the standard choice would cover the need. The standard choice stems from experience and can be controlled with the item groups and item numbers; if an item exists, i.e. has a registered item number in the ERP-system, it should be the standard decision. As an underlying factor for both cost estimates and for the technical choices lies the internal budget price. (Westman et al, 2012)

When the internal aspects have been examined, the specific technical choices and the investigation of them start. The specifications are highly dependent on the kind of product that should be ordered, and apart from company-specific requirements and technical possibilities, they also have to follow a range of directives, laws and to some extent industry standards. (Westman et al, 2012)

The external aspects consider laws, regulations, directives etcetera and there is no common collection of such documents at the company, states Nilsson, the quality assurance engineer. The reason for this is that knowing whether to check certain aspects is experience-based and the person responsible for the proceeding of any purchasing process knows which things he is responsible for and which the supplier is responsible for (Löfgren, 2012). Examples of external aspects important to consider during the purchasing process are:

- The machine directive
- Industry standards
- Energy directives
 - Including SIL (safety integrity levels) and PL (performance levels) that are standards
- CE-marking
- Flammability directives
- REACH (directive)
- ATEX (directive)
- Noise directives
- Vibrations (standard)
- Radiations (standard)
- Refrigerants and chemicals (directive)
- ISO-certificates
- PFE

PFE, the program for increased energy efficiency (Sw. Programmet för Energieffektivisering) is an optional law that Höganäs has chosen to adopt and therefore shall meet (Löfgren, 2012). It should be noted that not all documents are needed in each and every purchase procedure. For simple items, the list has to be downscaled and it is also clear that for instance an item that does not contain any electrical parts does not need any documents dealing with electricity.

Searching the external market also includes finding suitable suppliers. If a supplier can be found in the ERP-system it is seen as an approved one and is not investigated further on non-product related matters. If the supplier has not been bought from earlier but could be interesting, there are some things that should be checked. The economic status is checked through credit control. This credit information is especially important if the new supplier should supply the company with items important for the continuous production. Related to this is also the quality, specifically the quality history. Such information travels through the industry but depending on how important the items are, Höganäs has to make sure by themselves the supplier has a history of good quality. In accordance with the ethics of Höganäs, the supplier also has to have satisfactorily ethic documents and codes of conduct. (Westman et al, 2012)

At approximately 90 percent of the “larger” purchases, the purchasing department is connected in this step of the purchasing process. But when dealing with “smaller” purchases and 10 percent of the

“larger”, it is not connected until step A7 – where one supplier has already been chosen by the buyer. This is not a very large problem when dealing with suppliers with whom a long relationship exists, and where it is obvious that this supplier would have been chosen by the purchasing department anyway and not very much negotiation is needed. The purchasing department’s role in this case is limited to check the price and other overall facts. If the purchasing department is supposed to negotiate, it is naturally useful to have been present during the whole process. Olsson and Palmquist state that the purchasing department “*should be connected where we have something to provide or bring*”. (Olsson & Palmquist, 2012)

A3 Requests for quotations

The requests for quotations are sent out to possible suppliers. The supplier has to be able to fulfill the technical specifications (including electrical and mechanical standards) that are set by the company, and they should also ensure that laws and directives are fulfilled. (Westman et al, 2012)

For smaller, more frequently purchased items, it is assumed that the suppliers follow the mandatory requirements, (which should be the case if they should be able to sell anything). For the larger ones, following regulations, laws etcetera is ensured mostly while e.g. making the drawings or calculating on it, or if developed together with a supplier it is ensured along the way. (Löfgren, 2012)

As a decision basis the following points should also be stated by the suppliers (Westman et al, 2012):

- Supplier’s risk analysis
- Supplier’s documentation
- Supplier’s manuals
- Maintenance responsibilities
- Report chemical products
- Education – needed and provided
- Assembling responsibilities – at least an indication
- Technical responsibility

The following points should also be handled in some way. They can be more or less well-stated by the supplier but are specified during negotiations. (Westman et al, 2012)

- Commercial/payment terms
- Delivery terms and time
- Directives and laws – not which laws but that they are fulfilled
- Secrecy - general and ownership of construction/drawings
- Safety regulations – to receive it
- Time for request
- Warranties, penalties, fines
- Period of validity of the quotation
- Receiver of the quotation

The requested information should be adapted to the certain item in focus; no information on chemicals is needed if the item does not contain any chemicals. Of course there also has to be a balance between

requirements and fulfillments – one does not send a brick of requirement requests if the purchase deals with smaller amounts of money. The supplier should be able to get through the information. Experience is most often the basis for knowing which documents that needs to be requested or controlled (and also attached to the purchase at different steps of the process). The knowledge of internal requirements is entirely experience-based, and any documentation on this does not exist. (Westman et al, 2012; Löfgren, 2012)

A4 Evaluation of the requests for quotation

The first and foremost activity at the evaluation of the quotations, which almost makes up the whole step, is to check the correspondence of the received quotations with the original request. Suppliers that fail on important points are rejected but suppliers with small deviations might be considered, depending on the deviation point and how important this is to Höganäs. If it is seen necessary, visits at suppliers' sites may be done. This gives a valuable impression, above all in terms of the quality of the suppliers. (Westman et al, 2012)

An important part is to make an assessment of the total cost, i.e. the cost for the full implementation of the item bought. There might be matters in relation to one specific supplier that will give a lower total cost for Höganäs even though a quotation does not have the lowest price. One plus one does not necessarily equal two if one should account for e.g. continuous education and a long implementation. Costs can also appear if the company receives items with new technology that deviates from industry standards or Höganäs standards. A thing that might not be measurable in monetary terms is warranties, this is however an important aspect to consider in the evaluation. (Westman et al, 2012)

A5 Choices of suppliers and A6 Negotiations

Known suppliers usually have a lead and advantage in the supplier choice phase. But when the purchases are complex and/or deals with a lot of money some suppliers may be invited to present their quotations. (Westman et al, 2012)

The negotiation preparation is jointly performed by the purchasing department and the buyer or project manager to make sure that there is an internal consensus around commercial and technical positions (Olsson, 2012). Negotiations with one to three suppliers are then held, and those negotiations are initiated and handled by the purchasing department (Westman et al, 2012). Suppliers, or the single supplier, should then update their quotation which leads to the next step in the process (*ibid.*).

Documents that the purchasing department is responsible for in this step are payment terms (which have to be decided from case to case), delivery conditions, and warranties. The negotiated delivery date has to be checked specifically. It might state that delivery should be done 14 weeks from the date that the order was clarified. This means that the order confirmation sets the specific date, but Höganäs, from their side, can only know when the order is sent from them, not when the order confirmation will be received. This implies that the negotiated 14 weeks do not start until the supplier chooses to send the confirmation. Often the NLM¹⁰ is used to state the general terms, but then all deviations that are needed or requested have to be put down in black on white. (Olsson & Palmquist, 2012)

¹⁰ NLM is a collection of general provisions used for “delivery including installation of machinery and other mechanical, electrical and electronic equipment in and between Denmark, Finland, Norway and Sweden”. (Anon, 2010)

A7 Supplier selection

If the process is gone through in the desired way, the purchasing department should both be involved in and be able to make the supplier selection. With all required information on hand, gathered throughout the process and from earlier supplier evaluations, the purchasing department should be able to select the most suitable supplier at this step. (Olsson & Palmquist, 2012)

Sometimes there is only one supplier who is appropriate for the specific product, which is often the case with large machines from a certain supplier who is said to be “*the only one in the world*”. Even though more than one supplier may be relevant, one specific supplier is usually already chosen by the buyer or his/her department at this stage. Most commonly, old purchasing documents that contain information on e.g. suppliers are used to decide upon the supplier selection (Löfgren, 2012). The problem with this can be that the supplier is chosen just because it was the easiest choice in some way. One implication of this is that the price can be unnecessarily high. The price should not be the critical decision factor – quality is sometimes much more important – but a review of alternatives is what the purchasing department could have contributed with. If alternatives really are checked by the buyer, the purchasing function should be involved anyway to be able to be aware of what is purchased. This is a matter of balance between the size and cost of the product and when it becomes ridiculous to leave the whole purchasing process to the purchasers. (Olsson & Palmquist, 2012)

A8 Purchase requisition

The purchase requisition step is the step where the purchases get their purchase order number, which are unique numbers for all purchases. It follows the purchase through the whole purchasing process and should for instance be stated on the invoice (by the supplier). (Westman et al, 2012)

The purchase requisition is issued by the buyer in the ERP-system. Apart from things like price and quantity, it is here also stated the internal buyer, the internal receiver or rather the internal delivery address, goods labeling (at least the purchase order number), and what labeling is required on the supplier’s documentation (invoices etcetera). The buyer is not always the same person as the receiver, and how to handle this is not clearly stated in terms of e.g. who to notify when goods are delivered. The requisition is supplemented with documents, e.g. drawings, quotations, or data sheets, via e-mail and, *that they are*, is stated in the requisition (Westman et al, 2012). The explicit procedure within the ERP-system is described in the *Outlook* below for the interested reader.

Within the system it is only possible to write one line of requisition, meaning if the buyer needs five items from the same supplier, he/she has to write five purchasing requisitions, and this causes some issues both for the technical department and for the purchasing department (Westman et al, 2012). An actual example of this is when a buyer had put three out of ten orders as purchase requisitions, and then got a call and was away for ten minutes. During this time a purchaser had handled those three lines and sent the order to the supplier. However, the buyer got back and put up seven more order lines to the same supplier. This resulted in two orders to the supplier which could have been one if the ten different items could have been written in the same requisition. (Olsson & Palmquist, 2012)

Outlook – Requisition procedure in the ERP-system

A work order number is necessary to create to at all be able to conduct a purchase within the company's ERP-system. It is (also) needed to be able to connect costs to objects and to be able to follow costs in, for instance, projects. When the work order number is created it is possible to buy items on it (or debit it with working time).

To conduct the actual ERP-procedure for purchases the following steps are followed:

- Find the item through name or item number, which leads to the “purchase window”. This first step is, however, not as easy as it sounds due to the inconsistency in the naming of the items mentioned earlier.
- Put in all requested information; supplier, purchaser, unit, price, receiver etcetera, and also an item description.
 - In case of a “large” purchase, that is when many items are grouped and handled as one purchase and hence only explicitly described in the quote, the item description will simply state “According to quote”. This is commonly used since the software only allows the user to type one order line, but questions are raised around this with regard to the traceability of the purchase. The quote is sent to the purchasing department through e-mail with the sender manually stating which purchase it belongs to. It is hence only possible to see the quote and get the connection to the purchase if the specific purchaser is at the office (and is checking his/her e-mail).
 - The price may not always be stated at this point (e.g. when it is dependent on decisions further on in the process). The solution to this is to write 0.01 kronor in the price cell. It would be possible to set the expected price according to experience but then the executing purchaser will probably not react on that it is not the final price.
- The purchase is then done to the extent that a purchase requisition has been created. This also contains a goods labeling, which is important to also get the supplier to use.
- The purchase requisition is handled by the purchasing department and sent as an order to the supplier. It then disappears from the ERP-system.

Source: Löfgren (2012)

A9 Purchase order

What has been decided upon in the process up to this point is now formalized into a purchase order. This is generated by the purchasing department from the purchase requisition. The buyer, the goods receiving department and the supplier get a copy of the order as a pdf-file via e-mail. When the purchase requisition is handled by a purchaser, i.e. transformed into a purchase order, the requisition disappears from the ERP-system. (Westman et al, 2012)

Documents and files, like drawings, linked to a specific purchase order are connected to it by being in the same e-mail, and hence it only exists together in those e-mails, either with the requisition sent to the (specific) purchaser or with the order sent from the purchaser. (Löfgren, 2012)

A10 Order confirmation

The order confirmation is received from the supplier by the purchasing department and a copy of it is forwarded to the buyer and the goods receiver (if this is not the same person). However, before forwarding it, it should be controlled against the purchase order. If needed, it should be corrected via a new purchase order. What is important in connection to the order confirmation is to monitor that it actually arrives. As was mentioned under *A6 Negotiations*, it should be received within a reasonable time from when the order was sent. (Westman et al, 2012)

The order confirmations are received either by e-mail or by mail, and the documents cannot be kept as files in the ERP-system (Olsson & Palmquist, 2012).

A11/B-2 Delivery and Goods reception

The goods reception is located as a part of the warehouse and most of the deliveries are received there (Äglid, 2012). Each and every box or package is checked off by warehouse personnel (Molin et al, 2012). A reception document is attached to the package and this is the confirmation that it has passed through the goods reception (*ibid.*). All deliveries coming to the goods reception are also registered in the ERP-system by the goods reception personnel (*ibid.*). Items that should be stored in the warehouse are unpacked and put on the shelves (*ibid.*).

Packages that should not be stored, e.g. a product included in a project, are just checked off and sent almost directly on internal delivery (Äglid, 2012). The item can be sent to a temporary stock, intended for a project, and then there is no routine or automatic message telling the buyer or the receiver that a delivery has arrived (Molin et al, 2012).

The delivery sometimes reaches the receiver without having passed through the goods reception; some project items or investment items, particularly very large ones, are not suitable to at all be in the goods reception area. The purchasing department and the technical department handle such deliveries together. This includes the receipt of the goods in the ERP-system, which is usually performed by the person at the technical department who is the buyer, or sometimes the receiver. (Molin et al, 2012)

It may also be that the delivered goods are so small it fits in an envelope and might be sent straight to the buyer because of this, instead of going through the goods reception (Olsson & Palmquist, 2012). This means that the purchasing department never knows it has arrived and implies that when the invoice is received by the financial department, there is no confirmed delivery (Olsson, 2012). The invoice then has to be forwarded to the purchaser who handled the purchase, who in turn has to check with the receiver whether the item has arrived (*ibid.*). After this procedure, the delivery can be confirmed and the invoice paid (*ibid.*).

The payment is made if the invoice matches the order and the leaflet, when the goods reception is done and when the receipt is registered. The goods reception hence triggers that the payment of the invoice can take place, according to what is stated on the leaflet. Although the occurrence is not frequent, it implies that it is possible to pay for the wrong amount, or even the wrong item, since the packages (of items not stored at the warehouse) are not opened at reception. (Molin et al, 2012)

A12/B1 Internal delivery

Internal delivery of warehouse items occurs daily and usually hourly to the production facilities. Internal delivery also occurs frequently of the PPE purchases delivered to the goods reception; the received goods are delivered to for instance a storing location of a specific project. (Äglid, 2012)

All goods are delivered or sent to the (internal) address stated on the order by the warehouse personnel or the internal postal service. Silence from the receiver equals a quittance on that the item is received. Since the buyer or receiver does not always know that his or her product has been delivered to site, he/she calls the goods reception to see if this has been done. An example on this situation is when

items are internally delivered to a place intended for a project, i.e. a project storage location. (Molin et al, 2012)

A13/B-1 Goods inspection

For items that should be stored in the warehouse, the goods inspection can be said to coincide with the goods reception since they are unpacked and thus controlled. Apart from the amount and any transportation damages, other visible defects are also controlled, i.e. the warehouse items are visually inspected as far as it is possible. (Älgliid, 2012)

Goods inspection on PPE purchases not made through the warehouse, i.e. the most common case, is not done at all today in a standardized or uniform way or place, nor is it a specified task for any employee. Inspection is made on transportation damages as items are delivered to the goods reception, but not on quantity (or functionality). Goods inside cartons are assumed to be what the leaflet on the carton says, which means that any failure of the kind that it is the wrong item is not discovered until the item should be used, which may take weeks. If the item is the right one but anything is wrong, e.g. breakage during transport, the same dilemma holds – time have elapsed which may incur problems with returns and even more time will elapse when one has to wait for a new delivery, which of course affects the whole project. (Westman et al, 2012)

The goods inspection of PPE items, not bought via the warehouse, can hence be said to be two-, or even three-fold; transportation damages on packing are controlled when the goods arrive, visible defects and quantity are controlled when the receiver unpacks the goods, and then there is the functionality that by natural reasons cannot be controlled until the items are in use. (Molin et al, 2012)

What is meant by the process step *A13 Goods inspection*, shown in the longer process map (*Figure 22*), is therefore a matter of “unpacking inspection”, made by the goods receiver and at no specified point in time, and the transportation/packaging damages inspection is made earlier at goods reception. The step *B-1 Goods inspection* (in *Figure 23*) includes the packaging inspection, the quantity control and visible damages.

A14 Post-purchase activities

All Höganäs’ suppliers are treated in one out of two possible ways when evaluated, which is done once a year by the purchasing department. Suppliers of direct material are evaluated separately and suppliers that are relevant for PPE purchases are evaluated like indirect material, which means that they are treated as groups and in more general terms. There are fewer requirements on the indirect material suppliers than on direct material suppliers, but suppliers with whom there is any dissatisfaction become subject to measures. However, such a supplier does not end up on any so-called black list. (Molin et al, 2012)

Suppliers that deliver items that are stock-kept at the warehouse are also evaluated in group and there are no commonly stated follow-up procedures. However, with the “large” suppliers, communication is held daily regarding the deliveries and item quality. Some of them are said to be quite dependent on Höganäs which implies courteousness and that many needs are met. (Älgliid, 2012)

For all equipment with machine number, the information about warranties should be inserted in the ERP-system, which is most appropriately done in connection with the so-called machine-FMEA. With

a machine-FMEA the amount of spare part needed to be stock-kept at the warehouse is also calculated. (Molin et al, 2012)

Regarding documentation it is the buyer who has the responsibility for ensuring that all facility documentation, e.g. instructions and purchasing documents, gets up-to-date when a new machine, for instance, have been bought and also that it is put in the right place. The last payment to the supplier is made when all documentation concerning a machine have been received. (Molin et al, 2012)

5.2.2. A purchasing example - Following the purchasing of a control system through the process

The following example of a purchasing process is a description described from the Electrical engineering department's point of view, and more specifically the view of the manager of this department, Löfgren. One of the most complicated purchases is considered to be a control system. By complicated is meant that it contains many parts and therefore in a total requires large amounts of specification, and usually much money is involved. All purchases are treated together and are considered to be one purchasing operation (Löfgren, 2012). This example also highlights that all steps in the described purchasing process are not required for each and every purchase and the ones actually performed do not follow any standardized procedure, but are performed on experience.

The company continuously wants to improve its operations, therefore can *a need arise*. This may for instance be a new capacity requirement or a necessity or will to modernize (either because of an error or because there is a need to increase safety). The idea is, however, that Höganäs wants to build a new process line, for instance a new furnace, and therefore need a new control system. Because of the infrastructure in the factory it is already at this stage decided which supplier is preferred. (Löfgren, 2012)

The question on *specifications* is then raised. To start with, a flow chart is drawn by Electrical engineering and Mechanical engineering (sub-departments of the technical department) together with a process instrument and devices (PI&D). Security standards also have to be produced since with a control system a security system has to come. A range of regulations have to be considered in relation to this, e.g. concerning environment and noises. (Löfgren, 2012)

Electrical engineering has to find out about all signals that are needed for different parts in the control system. Each machine therefore needs to be broken down, on the drawing table, into their smallest components, which in the following will have unique identities. This evolves into an I/O-list (a list with each and every signal in the facility) and is the foundation for the drawings and what parts that needs to be purchased. (Löfgren, 2012)

Experience is the basis for knowing which documents that needs to be attached or checked. Any documentation of internal requirements does not exist; this is entirely experience-based. There are Excel-sheets containing information on what has been purchased earlier and it is common to have a look at those and make decisions based on that information. (Löfgren, 2012)

In cases when Electrical engineering is seen as the internal supplier and hence is the constructor of the whole system, it is in their hands to ensure that laws and regulations are followed. One has to go into detail in every component and check whether requirements on safety, standards, directives, and so on

are fulfilled, and the whole chain of items naturally has to fulfill this. The responsibility for this is held by the manager of Electrical engineering. Other possibilities are that the system is bought as a whole from the supplier or as a part of a larger unit. In the first case the suppliers has the responsibility to ensure that important aspects are followed and in the other, the supplier is responsible for the part that is bought. (Löfgren, 2012) See *Figure 24* on this, with the example of CE-marking.

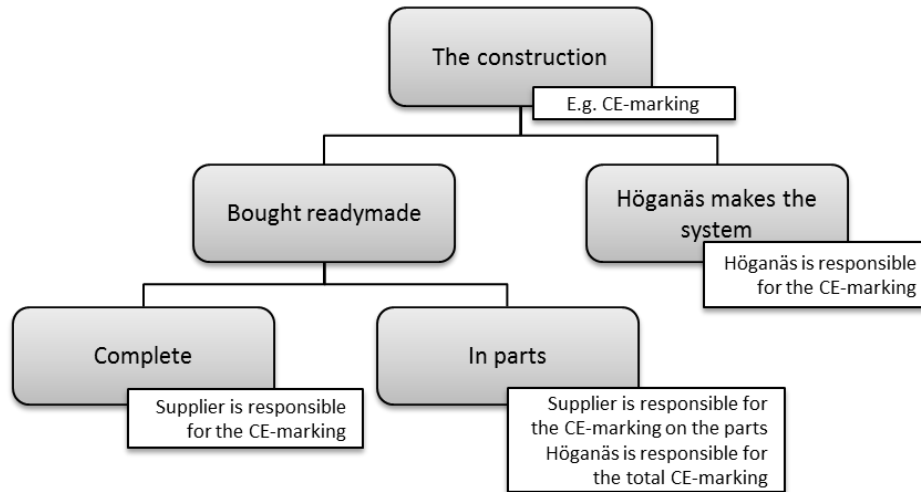


Figure 24. Responsibility of e.g. CE-marking between Höganäs and supplier (Compiled from Löfgren (2012))

The specific example of CE-marking is an important example. That a product is CE-marked (CE stands for *conformité européenne*) means that the supplier or manufacturer ensures that it meets the European Union's requirements (i.e. directives) on health, environment and safety (SIS, 2011). There are a range of such directives that cover different types of products (even toys), and examples relevant for Höganäs are the directives on electrical equipment and on machines (*ibid.*). There are naturally costs involved in ensuring that a company's products get this marking and it is therefore preferable to get the marking together with the purchase of an item, instead of having to do it and pay for it oneself (Westman, 2012). Specifically it is the risk analysis made to get the CE-marking that is interesting for the buyer (*ibid.*). It does not ensure that the buyer's production will be risk free but it is a piece in analyzing the own production processes' risks (*ibid.*). Important for the purchasing process is thus to ensure that there is an agreement of receiving the risk analyses, before one pays for it since it is not an obligation for the seller to provide it together with the purchased item (*ibid.*).

In this case, the case of the control system, the *supplier choice* is already done. As with all process equipment, the decision to cooperate with this large and experienced supplier has been made. It is pronounced that the effort should be made to use the same supplier for these kinds of equipment, which is the same as buying the same brand over and over. Examples of reasons for this are:

- To avoid having to gather new knowledge, which comes with new brands;
- To get a contingency; new versions or generation updates are much easier to implement than new equipment from another supplier - few new settings are required and much less new teaching/learning is needed, and;
- To avoid different kinds of spare parts.

A frequency converter is also needed together with the control system. For this, Höganäs wants the same supplier due to the fact that e.g. maintenance repairers know about the physical appearance that the supplier use for different parts, and the suppliers follow their set standards although new product versions are developed. One always wants to get started as soon as possible, for the first time or after reparation, and therefore one does not want to spend time on that for instance repairers or operators should learn to handle new systems. (Löfgren, 2012)

Any supplier that does not sell items or machines in their own name (some kind of first-tier supplier) may prefer one brand in front of another that they sell, and hence they set the price in favor of this brand. However, usually at least two of the largest brands (i.e. second-tier suppliers or large first-tier suppliers that sell their own brand) can be provided and then it is more worth to pay extra to get the preferred supplier/brand, due to the points outlined above. (Löfgren, 2012)

When the time has come for *contract agreement* within the process, many details have already been decided upon since the supplier has been a part of the process almost from the very beginning, as is the case with all purchases of this kind. One reason for involving the supplier in an early stage is that the supplier needs to be prepared for that a large and advanced order (at least in the buyer's point of view) is about to be received. (Löfgren, 2012)

When all specifications are finished, a request for quotation is sent to the one supplier, with all specifications and prices. This becomes the starting point of the negotiations. Höganäs may in the first negotiation phase describe how they want the machine to be built. Trade-offs between time and cost need to be considered – it is still important to not stand still too long. Any suggestions from the supplier on changes will come in this step if the earlier discussions have not been very intense. (Löfgren, 2012)

Next comes the agreements on warranty periods, fines and alike, however, such matters are usually managed through general agreements. On the other hand, aspects like warranty periods do usually not require any long negotiations since the agreements are formed with regard to the long-term relationships. The quote takes another round to be fully completed, but the more that is prepared, the faster the quote comes back. Small items that the supplier knows is required to put the whole control system together but which earlier have been seen as too simple or obvious to specify, is automatically added to the quote to make it complete. An important (internal) reason to why Höganäs wants to have each and every item specified in the quote is that the quote then can be managed as only one purchase in the ERP-system, even though it contains a range of different items. When the final quote has been received by the buyer from the supplier, a copy is sent to the purchasing department. This is where the purchasing department is connected the first time. (Löfgren, 2012)

The purchase is then registered in the ERP-system, by the buyer at the technical department, and sent to the purchasing department as a purchase *ordering*. This is handled by the purchasing department and the purchase order is sent back to the technical department as well as a copy to the supplier, i.e. this is the specific, legally binding, order that states that Höganäs has decided to buy one/many specific item/-s from the specific supplier. In the purchase order, the purchasing department might have stated parts of the quote; otherwise this information does not exist anywhere else but in the quote. The purchase order is also sent to the one who should receive it in the end at the specific plant, i.e. if the receiver is not the same as the buyer, two purchase orders are sent within the company by the

purchasing department. The supplier is then supposed to get back with an order confirmation, which is then the legally binding document. This should take no more than one week (after the purchase order has arrived at the supplier), but sometimes it happens that the order confirmation arrives even after the delivery. The negotiated date for delivery has to be controlled against the date on the order confirmation. A possibility is, for instance, that the purchase order states that delivery shall be made 30 days after the order has been received, which by the company is a specific date, i.e. 30 days after the date stated on the purchase order. If the supplier states another date on the order confirmation, i.e. the date the confirmation was sent, there is directly a discrepancy. (Löfgren, 2012)

If no problems occur along the way, the next step is *expediting*, i.e. delivery and goods inspection. At goods reception the things delivered are checked off according to the leaflet. If everything is correct, the invoice and payment procedures are almost automatic. If a residual entry is made on a delivery, the payment is withheld. It may be that a purchase is supposed to be split and delivered to e.g. three different places; the delivery is then not approved until all three parts are confirmed arrived and the payment is withheld until then. It could be that the price is unknown, which implies that the invoice has to be checked and the price noted by the Electrical engineering manager. (Löfgren, 2012)

6. Analysis

This chapter reflects on the data gathered in the previous chapter and present the findings revealed through this. It begins with purchased items at the case company and how those can be categorized. Then the purchasing processes, the theoretical and the practical, are analyzed and compared. This is then further analyzed by the means of the purchasing portfolio model, which in turn leads to the next chapter with suggestions on standardized purchasing processes.

6.1. Purchased items

6.1.1. Established groups of items

Höganäs uses both what they call product groups and item groups, which are used for all items at the company. These groups are said to have a logical connection, but this seems to be difficult to discover. It is stated that the product groups are mostly used for financial matters and not for either operations or purchasing, whilst the item groups are the actual groups used within the purchasing area. Due to this fact together with that the naming and constitution of the product groups seem to be “very internal” the item groups are the ones further focused on here.

Höganäs has a lot of items, i.e. item numbers registered, and those numbers are highly involved in the purchasing procedures since such a number is required to be able to conduct a purchase. In the purchasing step of searching this internal collection, the buyer either has to know the number of the item searched for (among the 40 000 item numbers) or how to navigate through the item groups. It seems like the item groups are not satisfactorily easy used either since the company has established the so-called dummies to make it easier to find a suitable category. At first sight those dummy groups might seem appropriate to use for some kind of portfolio categorization, but when it is revealed that they cover item groups, in parts or in total, at different levels, the unstructured and arbitrarily grouping becomes visible. Instead, there is the PPE type categorization developed during the data collection that seem more suitable for the purpose of this study.

6.1.2. Production process equipment groups

The collection of data and information reveals the item type categorization; *articles, specific parts, manufacturing parts* and *special machines*. This was stated without any knowledge of the four product categories that Kraljic once pointed out. It can thus be seen as a strike of luck that they amount to the same number, but a fact is that the spontaneous Höganäs categories seem logical and appropriate, and in section 6.3. *The portfolio model* it will be revealed how these can be used for a portfolio categorization.

From the discussions with managers at Höganäs yet another distinction of purchases was found; *replacement of an existing function, a better function, a new function* and *an unknown function*. This breakdown takes a slightly different viewpoint. Instead of focusing on the specific item that should be purchased, it starts from the need, i.e. the buying situation. It is assumed to be a quite unusual viewpoint in practice and deserves to be discussed further.

6.2. The purchasing process

6.2.1. Process steps and activities

It is discovered that most theoretical purchasing processes has fewer steps than the one revealed at Höganäs. It may be that theory's processes, e.g. van Weele's (2010), is a simplified picture of reality, which of course is a characteristic of a model, but it seems to be too simplified to adopt it as it is in an actual company. However, with a deeper investigation one can see that each of the steps of van Weele's process contain much more than the process steps described at Höganäs, and thus that the main difference between van Weele's process and Höganäs' lies within how many activities each step include. In the following gap analysis, the headings follow the theoretical, "best practice", purchasing process steps wherein Höganäs' activities are grouped and analyzed. To start with, *Figure 25* illustrates how the practical activities fit into the theoretical steps. Although this figure has the shape of a Gantt-chart, any specific time aspects are not connected to it.

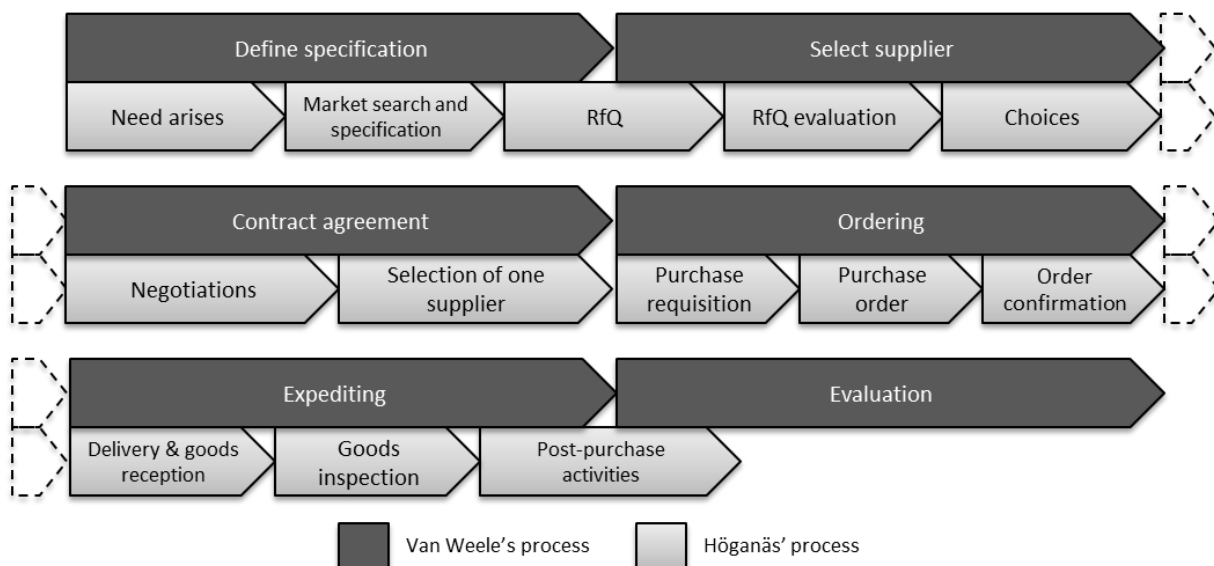


Figure 25. The practical purchasing process compared to the theoretical one

Define specification

Höganäs sets the first step to when the need arises, which van Weele does not explicitly include. This is not a very remarkable gap since any purchasing process naturally is triggered by a need, and is assumed to be understood in the theoretical process. What is noticeable anyway is that the appearance of the process may be different depending on where or how the need arises, which is actually an important factor in reality. This is discussed in literature, but then in connection to the buying situations.

The phase of defining specifications may look very different at Höganäs depending on what kind of PPE item that is to be purchased. Assuming that a rather advanced item is in focus, the specification is outstretched from where the need is recognized to when the requests for proposals are finalized. The specifications usually have to be stated from almost nothing or at least as a compilation of many small parts already specified. This is the case as for individual, less advanced products; there is often a stated specification, which has become an internal standard that should be followed. Any explicit separation

between functional and technical specifications, as suggested in literature, is not done at Höganäs. But when seen in quotes or orders, there is at least a clear division between commercials (including logistics and financials) and technical terms.

A problem connected to stating specifications is that it is very much based on experience – either experience possessed by individuals or information connected to older completed purchases, which are then seen as good examples. This is not only an issue for the specification phase, but is seen at many steps in the process, for example also when it comes to the external requirements on a product. This may concern an EU directive on environmental issues or an industry standard on electrical equipment that needs to be followed, either since it is legally binding or since it is needed to make the production process work at all. Höganäs do not have any kind of collection on this and it is not seen as needed today either, since the buyers know, by experience, what they have to check, state in the specification or ask the suppliers for. It should also be mentioned that checking or making sure that the products follows certain requirements is not entirely Höganäs' responsibility. Many of the laws or directives should be followed by the suppliers if they at all should be able to sell their products. It is thus a matter of checking this through the RfQs, which is done for many of the aspects. Although, very important aspects (e.g. an all-European law) that is seen as obvious that the suppliers follows, to at all be able to do business, are not asked for but assumed.

The RfQs are sent out to suitable suppliers and when those are returned the compliance of the received answers should be controlled against the sent out quotations. No statement on whose responsibility at Höganäs it is to do this has been indicated. It is however assumed that the involved person with the technical knowledge checks the technical information and that a purchaser controls e.g. the payment and delivery terms – although, this is not stated in any function description or similar documents. The activity of developing the RfQs is illustrated as stretching into the next theoretical step - defining specification - since it in practice is a dialogue with suppliers, and some specifications may change due to suppliers' opinions.

Select supplier

The literature describes the bidder's long list, which contains the suppliers that should receive a request for information. This is a pre-step to sending out the requests for quotations that are more detailed and this is not discussed at Höganäs. From the supplier assessment and an internal information gathering of suppliers, which is presumably not documented, only experience-based, the RfQs are directly sent to a small number of suppliers, which in theory is called the bidder's short list. When it comes to evaluating the RfQs, theory and practice seem to be more streamlined again.

When it comes to pick out suppliers that should get the request for quotation, there is a difference according to how large or advanced the purchase is. As described in 5. *The case company* the most advanced products are developed together with an already chosen supplier, and when it comes to the little less advanced, there is usually a certain supplier in mind when developing the specifications. However, when an actual selection should be done, experiences is the basis again and at this point even a local experience, meaning that it is held by only one or a few individuals at a certain department.

There are clearly diverse thoughts about when, i.e. where in the purchasing process, the purchasing department at Höganäs should begin to be a part of the process. It is common that a supplier already

has been chosen by the buyer when the purchasing function is contacted for e.g. transforming the requisition to an order. It would not be possible, or logical, to have the purchasing department being a part of each and every purchase from the very beginning, but when needed, for instance for negotiations, there are clear advantages in working as one unit.

Contract agreement

It is indicated that known suppliers have an advantage in the supplier selection, which is also stated in theory. For the advanced purchases, suppliers may be invited to present their quotations and this is also in line with what theory says.

The joint negotiation preparation between the purchasing department and the buyer or project manager is an important part in ensuring that the company has a united front, both in commercial and technical terms. The literature suggests a three-phase negotiation procedure; a pre-negotiation, a meeting, and a post-negotiation. Höganäs does not make a clear distinction between those but to some extent they are logical and also followed without any deeper considerations on what to do next. If the process is gone through in the desired way, according to Höganäs, the purchasing department should both be involved in and be able to make the supplier selection after the negotiations. Although, as described in connection to specifications, certain suppliers are often already chosen when the purchasing process step of selecting supplier arrives.

Ordering

The overall appearance of the requisition and order procedures at Höganäs is very alike the ones described in literature. Apart from logical circumstances, like that an order is placed and initiated by a requisition, the literature also points at the importance of stating all required information in the documents. This should also be done by the supplier on the order confirmation, which is emphasized by Höganäs.

What seems to be a large issue, stressed both by the technical department and the purchasing department, is that multi-position purchases cannot be handled in the ERP-system. For instance, if one needs five different types of items from the same supplier at the same time, one still have to make five different purchases and purchase requisitions, i.e. one row will be one purchase. This problem by its own may not be a topic for this research; it is rather an issue between Höganäs and the ERP-system provider on how to design the system. But the issues this implies have impact on the purchasing process in different ways. That this is the case can be realized by that the company actually tries to come up with solutions to adapt to the problems. One example of such a try is the cases where the buyer writes “*According to quote*” on the one position in the system, the actual items in focus are only stated on the quote, which cannot be found in the system. Connected to this is hence the large question on traceability of a purchase. This introduces another ERP-system design issue; that one cannot attach files that are connected to a certain purchase, or purchase process, like its order confirmation or a drawing, to be able to gather all relevant information around this purchase. These documents only exist at the buyer and at the purchaser who handled the specific purchase and the documents are only connected to each other by being in the same e-mail.

The order confirmation is not deeply discussed in literature and it is not an issue in practice either, as long as everything works out fine. The one issue that was highlighted in 5. *The case company*, was the

importance of controlling that the confirmation is received – especially that it arrives within a time from when the order was sent that is reasonable. This is due to that time periods, e.g. delivery, are stated in the order and it may be different from case to case whether the period starts at the date of the order or at the date of the order confirmation.

Expediting

Deliveries and the reception of the goods do usually not include any problems at Höganäs and no specific issues can be revealed according to this. The literature does neither put any large emphasis on those parts in relation to purchasing processes; it may rather be a topic in pure transportation discussions.

What can be highlighted in connection to the arrivals of goods are issues related to the internal deliveries. The buyer and the receiver can be different persons, and should be able to be, but the buyer does not get to know that the goods have arrived when this is the case. Sometimes the receiver neither knows that an item has been delivered, e.g. the example when items are internally delivered to a project storage location. This lack of information is supposedly a potential for errors, or time-consuming and therefore an efficiency improvement potential exists here. The case of not knowing where to place the goods when it has arrived is not fully clear either, which emphasize the importance of stating the internal delivery address on all relevant documents.

Literature states that products should be controlled at delivery to make sure that they meet what was stated in the purchase order and for assuring the quality. For many of the PPE purchases at Höganäs this is not possible since they are parts of process equipment and cannot be tested before taken into usage. As described in 5. *The case company*, the inspection of goods can be seen as two-folded or even three-folded the way it is performed today with inspection of transportation damages on package, quantity and visual errors on the product, and thirdly functionality when used.

The follow-up activities regarding purchasing files and matters like invoice administration are to quite a large extent handled in practice as in theory. The whole monetary process is completed almost automatically, if nothing remarkable happens along the way, following the check points of e.g. purchase confirmation and goods reception.

Evaluations

One of the more remarkable differences between the theoretical process and the practical process is that theory puts much emphasis on the evaluation step, and at Höganäs the evaluation of suppliers of PPE purchases extends to the group evaluations, as for indirect material. Evaluations in theory concern both suppliers and products. Products in the meaning of evaluating how well they solved the initial need, which actually connects back to the supplier's ability to deliver the requested quality (and the company's ability to state specifications). The limited evaluation of suppliers may imply that no black list, and nor an approved list, of suppliers can be developed, which in practice could be a very helpful tool in for instance the supplier selection process. Connected to this is also to have a supplier surveillance or control which today is not done in any standardized way. If any, it is rather the technical department than the purchasing department that does some kind of supplier checking.

In the following section, the analysis takes the form of developing a purchasing process, adapted to Höganäs, that takes the previous considerations into account, and can then be a basis for the process standardization.

6.2.2. Developing an adapted purchasing process

With the base in literature and with purchasing characteristics from the case company, it is appropriate to decide upon how many process steps that are relevant for the process of the PPE purchases. Different perspectives can be taken for such a division. One could for instance look at which department or persons that are in charge of certain activities and make it a new step when that responsibility changes. One could set the steps to be completed when a document is finished (e.g. a RfQ) or when a decision is made (e.g. a supplier is selected or a price is agreed). Although organizational decision making is both interesting and relevant, a step division focusing on the actual activities needed seems most appropriate since this seems to be most commonly used in literature and also due to the fact that the used, although non-documented, processes at Höganäs focus on activities.

When trying to divide the activities back and forth into suitable groups, the author returns to the amount of eight steps at several times, although six steps were seen as appropriate to describe it in from a theoretical perspective. This number, eight, is therefore chosen to be used to describe the overall process of production process equipment purchases at Höganäs. This might be seen as an arbitrary choice but its appropriateness will be revealed in the remainder of this chapter and is discussed in the coming chapter. An illustration of the process is shown in *Figure 26*.

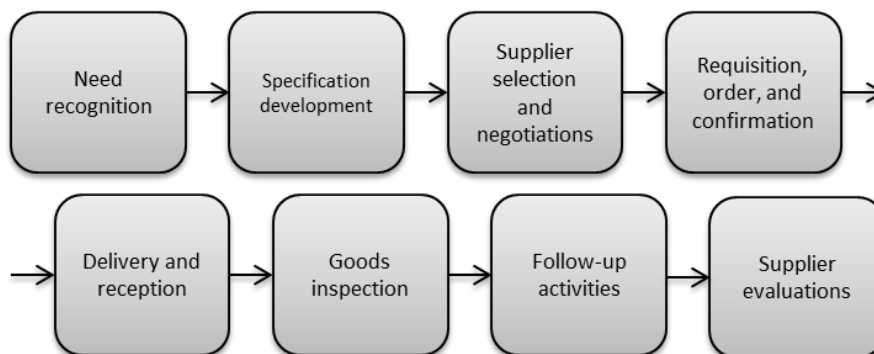


Figure 26. Suggested basic process for production process equipment purchases

6.3. The portfolio model

6.3.1. Finding the product categories

The connections between the categories of PPE purchases and Kraljic's product groups are very apparent. In *Figure 27*, the PPE groups are linked with the theoretical ones.

6. Analysis

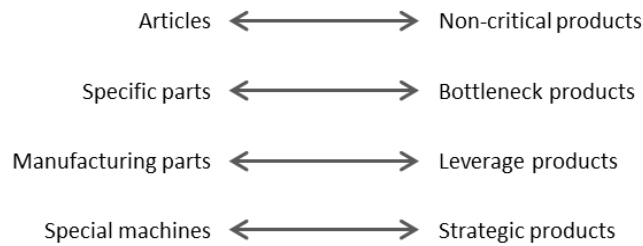


Figure 27. Höganäs' production process equipment groups and Kraljic's corresponding names for those

The articles have a low supply risk since there are many suppliers available and a multi-sourcing strategy is possible to use. The decision level for those items is concentrated to an operational level as is the case with Kraljic's non-critical products. The financial impact that those items, both the company's articles and Kraljic's non-critical, have on the overall results are low as well. On the opposite side of the scale of both purchasing's impact on financial results and supply risk, i.e. *high*, the special machine suits the characteristics of Kraljic's strategic products very well. The special machines are very particular for Höganäs and are only produced by suppliers at orders from the company. In most cases there is only one supplier that is seen as suitable, which implies a high risk for the company. The specifications for those items, or rather machines or equipment, are rigorous and are made very detailed, due to their large financial impact on the results. Those kinds of purchases are always known and discussed at top decision level.

The manufacturing parts and the specific parts correspond to Kraljic's leverage products and bottleneck products respectively. The supply risk for the manufacturing parts is low since many suppliers can be found for those items while it is high for the specific parts. The specific parts are specific for Höganäs and are commonly single-sourced but for the suppliers they are not seen as very advanced and hence their financial impact stays quite low. The reason to why the manufacturing parts reach a high financial impact is mainly that they require drawings or other stated specifications, which then need to be followed by the supplier.

In *Figure 28*, the PPE groups are placed in Kraljic's portfolio matrix. After this point and on, the author chooses to use the established denominations of the product groups.

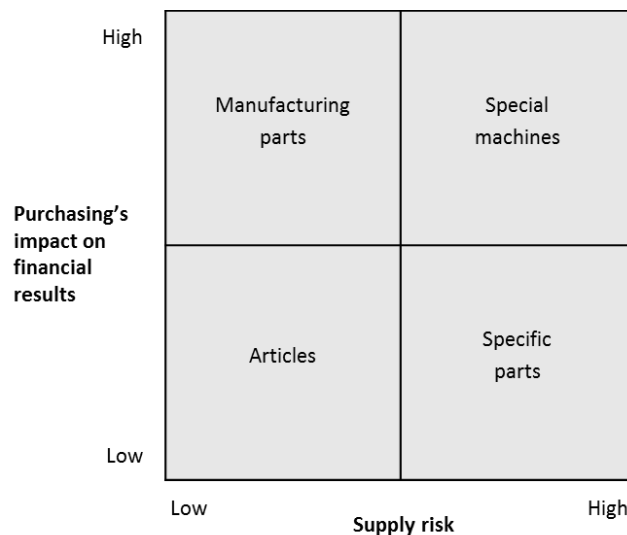


Figure 28. Groups of types of production process equipment items placed in Kraljic's portfolio matrix

As for the scope of this research the four different categories, described and illustrated above, are expected to be sufficiently detailed to be able to structure the purchasing processes of the PPE items. The contribution to the process standardizations of those product categorizations is the strategies corresponding to them, which determines the appearance of the processes.

Within the area of case company information gathering, it was discovered that the PPE items can be divided with regard to their anticipated function as well, i.e. replacing an existing function, be a better function, be a new function or a function that is unknown. This discussion is interesting since it has a strong connection to the buying situations described in literature, for example by Robinson (1967). The division is not explicitly used at the case company but the discussion is do have some strategic implications for the standardization of the purchasing processes.

Robinson (1967) distinguishes three different buying situations; straight rebuy, modified rebuy, and new task. It is not hard to see that they could correspond to the company's replacement, finding something better and searching for something new. The unknown function is difficult to distinguish from the new function, but since this division is not used at the company, no definition has ever been needed to state. An interesting elaboration could be to try to place also those *function types* in Kraljic's portfolio matrix. In relation to this, the unknown function is supposed to have both a higher supply risk and a higher financial impact than the new function only because of its unknown characteristics, it is however not seen as an important matter of definition at this point. The result of these placements can be seen in *Figure 29*.

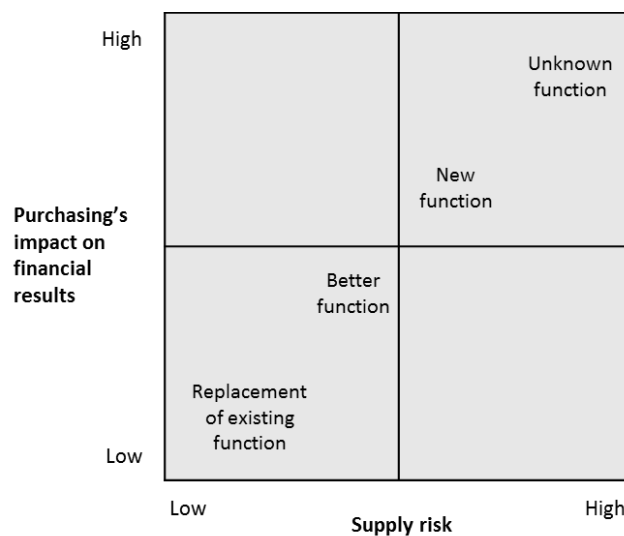


Figure 29. Production process equipment items' requested functions placed in Kraljic's portfolio matrix

As can be understood, those buying objectives do not fit into the two by two model since they increase linearly in both dimensions. Thus, this figure does not provide any extra information to how to create the standardized processes and nor is it directly connected to the *item type division*. But two main things seem to be possible to use the buying function division for. It can be used as extra strategic layers or characteristics to the purchasing process or support the strategies suggested by Kraljic (1983). An example is that in a situation with a new task, it is emphasized that one should put more efforts on the part of the process that deals with specifications and within a straight rebuy one should

focus on decreasing the administrative work. The second implication is that it to some extent can give hints on how long, i.e. complex, the processes need to be.

6.3.2. Finding the corresponding strategies

The intention of categorizing the items into different groups is to be able to adopt different purchasing strategies connected to them. Different strategies have to be adapted to different case specific circumstances but as stated in literature, the overall suggested strategy orientations have proven to work well and are used by many companies.

To avoid giving the reader a full reprise of this report's theoretical framework the following figure, *Figure 30*, gives a recap of the product categories' corresponding strategies suggested by Kraljic (1983).

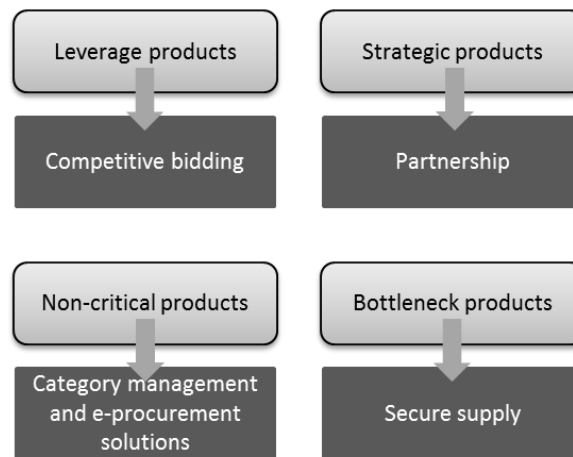


Figure 30. Theoretical product groups' corresponding strategies

The following chapter will give the suggestions on standardized purchasing processes evolving from this analysis.

7. Suggested processes for production process equipment purchases

The analysis in the previous chapter leads to the suggestions on standardized purchasing processes provided in this chapter. These are here illustrated and explained. The suggestions are then reflected on regarding their potentials for efficiency improvements by case company managers, who also give some thoughts on practical issues in case of an implementation of the constructed solution.

In the following, four purchasing processes for PPE items are presented. They correspond to the four product categories (*non-critical, bottleneck, leverage and strategic* items), have adopted the matching strategies (*e-procurement, secure supply, competitive bidding and partnership*) and are based on the underlying process described in the previous chapter.

7.1. Purchasing process for non-critical items

Since the amount of items and also suppliers in each product group is unknown within this project it is difficult to state whether for example any reduction of the supplier base should be emphasized. But by this it is not said that any improvement possibilities cannot be found. One of the most important focus areas within this group is to reduce the administrative and transactional costs. As literature suggests this can be done through more efficient processing, standardizing of the products and optimization of the inventory management (i.e. order volumes and inventory levels). Reducing the number of suppliers can, if it is seen as necessary, be done through category management.

In the case of Höganäs, developing efficient routines for ordering and administration seems to be the one question that should be prioritized for the non-critical items. The items are frequently ordered and easy to manage and should therefore not burden the company with the same administrative complexity as more strategic items. A suggested solution for increasing the efficiency is to adopt some kind of e-procurement solution together with suitable suppliers. One example is to create an internet-based catalogue or use one that is already developed by the supplier. The important thing is that it should include relevant items for the company and preferably enable that items can be ordered as groups. An overall agreement or contract should be decided upon in beforehand and for a suitable period of time, i.e. a long-going framework agreement. It is common that this is done by the purchasing department and the supplier, but in the case of PPE purchases it is recommended that also a person with the technical knowledge is involved.

With the systematic contracts stated it is possible for the buyer to order straight from the supplier – of course this person has to have both the jurisdiction and the power to do this. The supplier can send the order confirmation straight to the buyer based on what has been agreed upon in the framework agreement together with further specifications, e.g. specific type and quantity, within the e-procurement program. This implies that the purchasing department does not need to be involved in the day-to-day purchasing, a lot of administrative work is reduced and the purchasing process reaches an increased efficiency. One thing that should be thought through in the case of Höganäs is that the company may want to connect also these kinds of orders to the ERP-system in some way, for example to be able to create statistical data for future evaluations.

An illustration of how a purchasing process for PPE non-critical items can look like is shown in *Figure 31*, and further analysis and discussion regarding the steps then follows. The boxes with rounded corners belong to the basic purchasing process that was developed in an earlier section, and the extra boxes are the ones that differ between the four suggested processes, i.e. this one and the coming three.

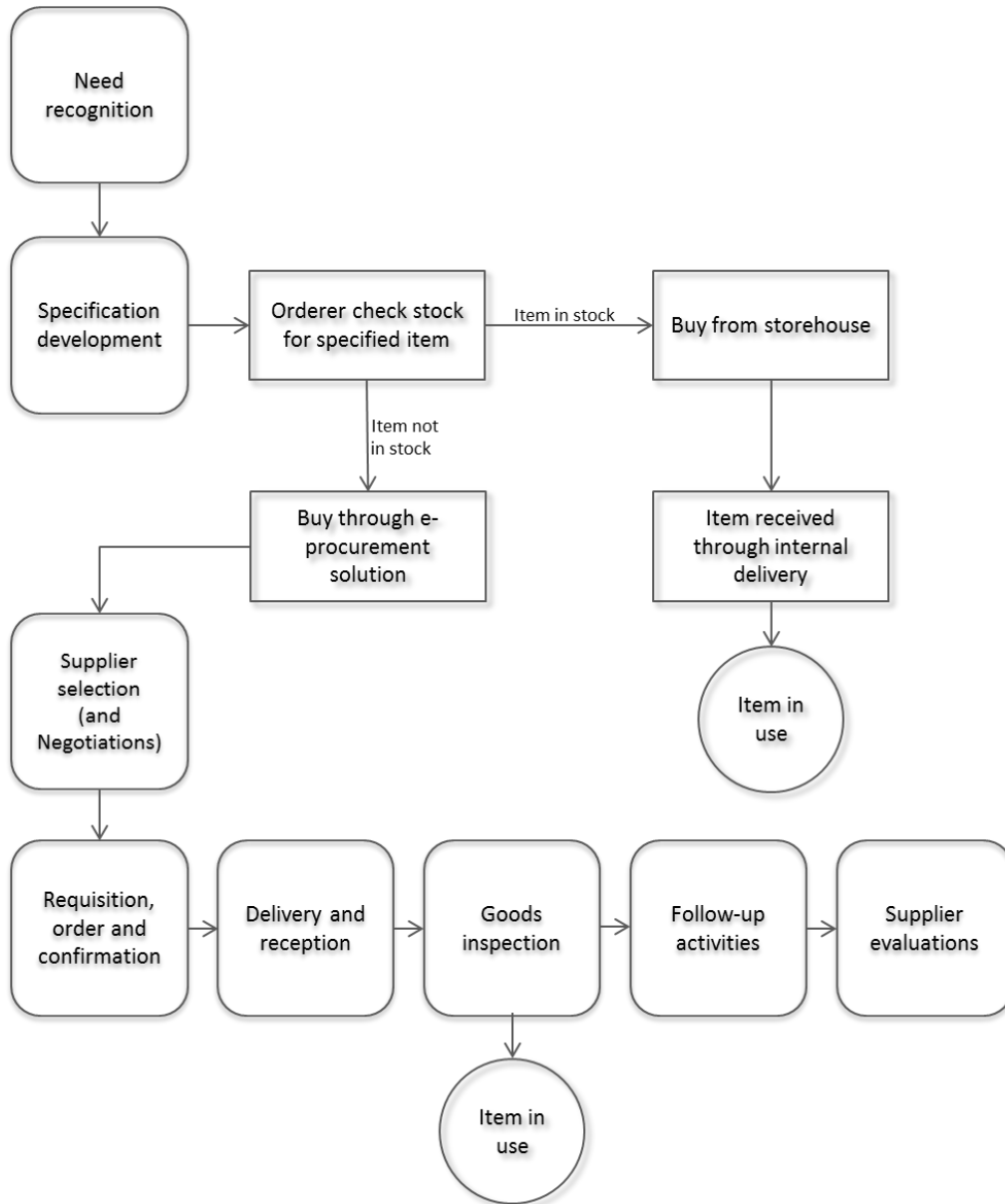


Figure 31. Purchasing process suggestion for non-critical items

Need recognition and Specification development: There might not be a border between the need recognition and the specification regarding those non-critical items, since there should not be much to decide upon. Within the step of specification development the focus is mainly put upon deciding quantity and specific technical requirements.

An important efficiency aspect at this stage is to establish a procedure that helps the buyer to know what specific items he or she should order, i.e. if there are any internal (or external) standards that either should be followed or preferably should be followed. This is to get away from experience-based or arbitrary choices. How this can be done is quite a specific matter that has to be decided and developed within the company with respect to its specific needs and requirements. One way to do it is to collect statistics over what has been bought earlier, not only by gathering old order documents but establish a proper database. However, this is still verging on experience-based manners and would require recurrent evaluations to make sure that the most frequent choice is still the best one. In short it can be said that a non-experience-based procedure needs to be developed to help the buyer both to decide faster upon what to buy and to know that he or she is buying the right thing according to internal statements.

The buyer should then check whether the item can be found in the warehouse. Proper rules for when an item should be bought from the warehouse have not been discovered within the study, and is therefore recommended to establish. This is important since it is strictly connected to the inventory management of the stock-kept items – if items are bought from the warehouse according to what the specific buyer personally decides the planning of the warehouse items fails.

When the item cannot be found in the warehouse (or when it is decided according to e.g. inventory rules that it should not be bought internally) the e-procurement solutions comes into use. Naturally, this process is based upon the fact that contracts already have been established for suitable items and suppliers.

Supplier selection (and Negotiations): The supplier selection is only relevant if the company has decided to have contracts for the same items with different suppliers, but still it should neither be a big issue and nor should it take any time to decide upon. Maybe it is already decided together with the specifications. Negotiations are not relevant in the process since this have been handled when contracts were established.

Requisition, order and confirmation: The purchase requisition coincides with the purchase order or does not exist at all in this process, depending on the viewpoint. Anyhow, ordering items through an e-procurement solution should not require any approval from the purchasing department and therefore the order is sent by the buyer and then the order confirmation should be received by the same person. The importance of stating purchase related information such as order number and delivery address is described in literature and has to be ensured through automatic requests within the program both for buyers and suppliers.

Delivery and reception: When items are delivered, which in most cases is done at the goods reception area in the case of Höganäs, it is only logical that the person who ordered them is informed, even though the final receiver is another person. A set procedure for this is not available at Höganäs today but its need is apparent. To ensure a high efficiency, items or products cannot be standing at a storage location without the buyer's and/or the receiver's knowledge about this. The technologically simplest way to make sure that those persons get to know about the goods' arrival is that the reception personnel send a manual message to them (which depends on that the packages state something that connects it to those persons). This is however assumed to be very inefficient and time-consuming. A more high-tech solution could be that when a barcode that is attached on each package is read,

concerned parties get an automatic notifying message. Of course, this is not a solution that is developed over a day; it requires IT-solutions, connections to all departments concerned and measures being taken by the suppliers. But if developed, it would enable fast connections and checkpoints for both information chains and financial matters.

Goods inspection: Literature states that items have to be checked at delivery for ensuring that they meet the stated specifications. A so-called acceptance test cannot be done when the goods have arrived since their functionality is not shown before taken into the production processes. The transportation damages are checked at goods reception and should continue to be done so. Ensuring that the functionality is checked as soon as possible is connected to that the receiver gets to know that the item has arrived, as previously discussed. When this person knows that, the author believes that when the functionality should be checked is best decided by that person.

Follow-up activities: As stated in literature, there are certain things that need to be done to complete a purchase. When talking about the non-critical items, they are however minimal since many of them should be done automatically. Although, within the follow-up of a purchase, it can be evaluated whether the process can be seen as straight rebuys or if anything has to be changed that instead makes it become a modified rebuy. This is an exceptional case for the non-critical items, since the characteristics of both the items and the e-procurement solution require routine procedures. What is meant with this statement is that one should be aware of that changes could be needed, e.g. delivery or payment terms or a technical specification for a quality increase.

Supplier evaluations: It is important to emphasize that even though the non-critical products are not the most strategically important ones, the company cannot stand without them. Evaluating the suppliers is therefore important, maybe first and foremost to ensure that the right price and quality is received and maintained. If the suppliers are not evaluated on a regular basis, the company may encounter sudden problems that could lead to that new suppliers have to be found, for instance, and instead of having a high efficiency because of the e-procurement solution, the efficiency will decrease again and cause higher costs.

7.2. Purchasing process for bottleneck items

The bottleneck items are crucial for the continuous production flow. This makes it important to make sure that the supply of those items is secured, even though it may be at a higher cost sometimes. The way of doing this is naturally different depending on whether the item is stock-kept or not. For stock-kept items optimizing the safety stocks is one of the emphasized methods stated in literature. For non-stock-kept such, the strategies should be more emphasized on creating back-up plans and maintain a kind of supplier control. Although, since the bottleneck items are more specific for Höganäs than they are for the suppliers, the company could search for a more effective way of handling the purchases. Hence, the strategies lean towards the ones that preferably should be used for the non-critical ones; standardizing items where it is possible (maybe using the overall industry standards) and finding reliable substitutes, both items and suppliers. This reduces the dependency towards the suppliers used today and enables efficient changes where it is needed.

The steps of this process that should be most focused on with regard to this discussion should consequently be the specification, the goods inspection and the supplier evaluations. Getting the

specifications right as soon as possible minimizes the change costs and finds a good relationship with the suppliers, which is important as it is one keystone in securing the supply. The goods inspection is extra important for the bottleneck items. Any errors should to the largest extent be avoided (from the company's side by being sure of the specifications) but if there are any, they should be found as soon as possible to avoid production problems caused by a shortage of equipment. Lastly, the supplier evaluations should be stressed again. Presumably they are even more important for the bottleneck items than for the non-critical items since the supply risk is higher, and they are tools for becoming aware of possible supply interruptions before it is too late.

Another strategy mentioned in literature that could be very useful for securing the supply of production equipment is to conduct risk analyses. This should be used to point out which items are the most essential in short-, middle- and long-term, and in the extension to form contingency plans if the risks become reality. This might lead to that more, or other, items are decided to keep in stock. To develop and be able to use information on supply and demand forecasts can be very advantageous and is a part of the contingency plans. Any market data that can help in securing the supply is beneficial to collect.

As can be understood from this section's discussion, most of the activities concerning the bottleneck items are not part of the process for each and every purchase; instead a lot of work has to be done outside the process. Hence, the process for bottleneck items is illustrated very similar to the one concerning non-critical items, see *Figure 32*.

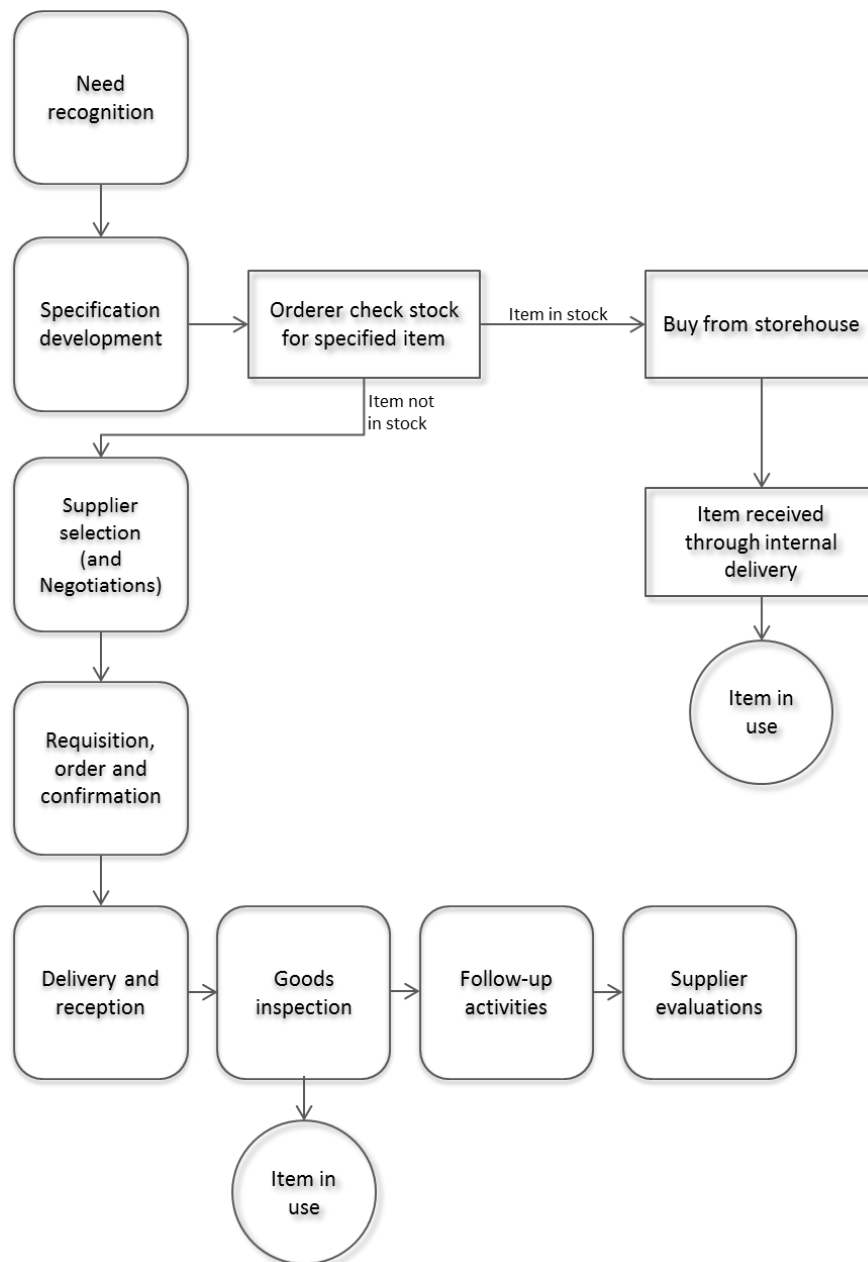


Figure 32. Purchasing process suggestion for bottleneck items

Need recognition: Within the need recognition it gets apparent whether the item needed can be seen as a new task, a modified rebuy or a straight rebuy. Even though it is seen as a straight rebuy, the modified rebuy should in most cases be considered since securing the supply is the most important factor and the thoughts about the item in this step affects which measures are taken later on.

Specification development: The development of the specification should be done with respect to suggested or stated standards, as said regarding the non-critical items, if the item is not entirely new, and therefore the same discussion around this holds also here.

Supplier selection and Negotiations: The supplier selection should be done emphasizing the importance of a continuous supply from the supplier, which should also be apparent within the

negotiations. Since the bottleneck items in Höganäs' case are more specific for them than they are for the suppliers, the focus should be put in ensuring that any new supplier can meet the requirements that the company has. The good thing for Höganäs about the bottleneck items is thus that the suppliers are more interchangeable and therefore the items less critical than what is commonly stated in literature for the bottleneck items.

Requisition, order and confirmation: When a requisition is being placed at Höganäs by the buyer, most commonly an engineer, it has to be handled (i.e. approved) by a purchaser. Requiring different persons for initiating the order and for placing the order is above all a way to ensure the legality of the purchase. The author is not in a position to discuss the internal legal aspects of purchasing at Höganäs but an idea is to consider whether the administrative tour of the purchases to the purchasing department is needed for the bottleneck items. They have a low financial impact just like the non-critical ones and should therefore not be burdened with unnecessary administrative costs. Talking in terms of time, the efficiency would also improve if the buyer could be able to place the order directly to the supplier. This would require some kind of pre-established contracting terms, and therefore it is suggested that some bottleneck items could be handled in the same way as non-critical items, i.e. through e-procurement solutions.

Delivery and reception and Goods inspection: The same discussion as for the non-critical items holds also here, both for delivery, reception and inspection of the goods. It is emphasized that both buyer and receiver need to know when the goods have arrived that this is the case. The internal delivery also depends upon that the packages are marked by the suppliers with the right (internal) address, which should have been stated in the order and order confirmation. That the goods inspection is seen as an important step for those items relies on that some of them are critical for the production contingency – the faster an error is discovered, the faster a new item can be ordered and the less risk for a production stop.

Follow-up activities: As previously discussed, the bottleneck items require a lot of work on side of the process, but it is matter of definition whether some of them should be seen as follow-up activities for each purchase. Finalized purchases can for instance be a data contribution for risk analyzes.

Supplier evaluations: Conducting supplier evaluations is vital since the supply risk is considered high. As literature states, having an up-to-date record of suppliers' capabilities, quality and deliverables is crucial for future purchases, for example to be able to form the bidder's short list. As also stated in literature, the evaluations and their scope might increase in importance with an increasing financial impact but this does not mean that they should be neglected when this impact is low.

7.3. Purchasing process for leverage items

The leverage items have a low supply risk but a high financial impact on the company. Therefore, the company can take advantage of the competition among suppliers and use a competitive bidding strategy. This can happen within the steps of sending out and receiving requests for quotations. Since the supply risk is low and many suppliers are available, i.e. they are interchangeable, the company can focus on getting the best deal for a short term and do not necessarily need to establish relationships. However, relationships can be established to the extent of being comfortable in purchasing higher volumes from some suppliers and thereby lowering the costs. This could lead to corporate contracting

similar to the ones preferably signed for the non-critical items, but still the buying company should not be afraid of reallocating purchasing volumes over suppliers.

The purchasing power is at the buyers. The focus can be put on identifying the product value, as stated in literature, together with its volume and thereby lower the materials costs. The price is important since small changes of it can have large impact on the results and hence the market should be continuously examined. Since also this group of items requires some information gathering outside the purchasing process, the purchasing department should be involved and be the one that collect for instance market data and vendor data. A lot can be gained in saving information from each completed purchase, including how suppliers are evaluated, and create some kind of statistical data base, for example to be able to forecast price and transport rates.

The purchasing process suggested for leverage items is shown in *Figure 33*.

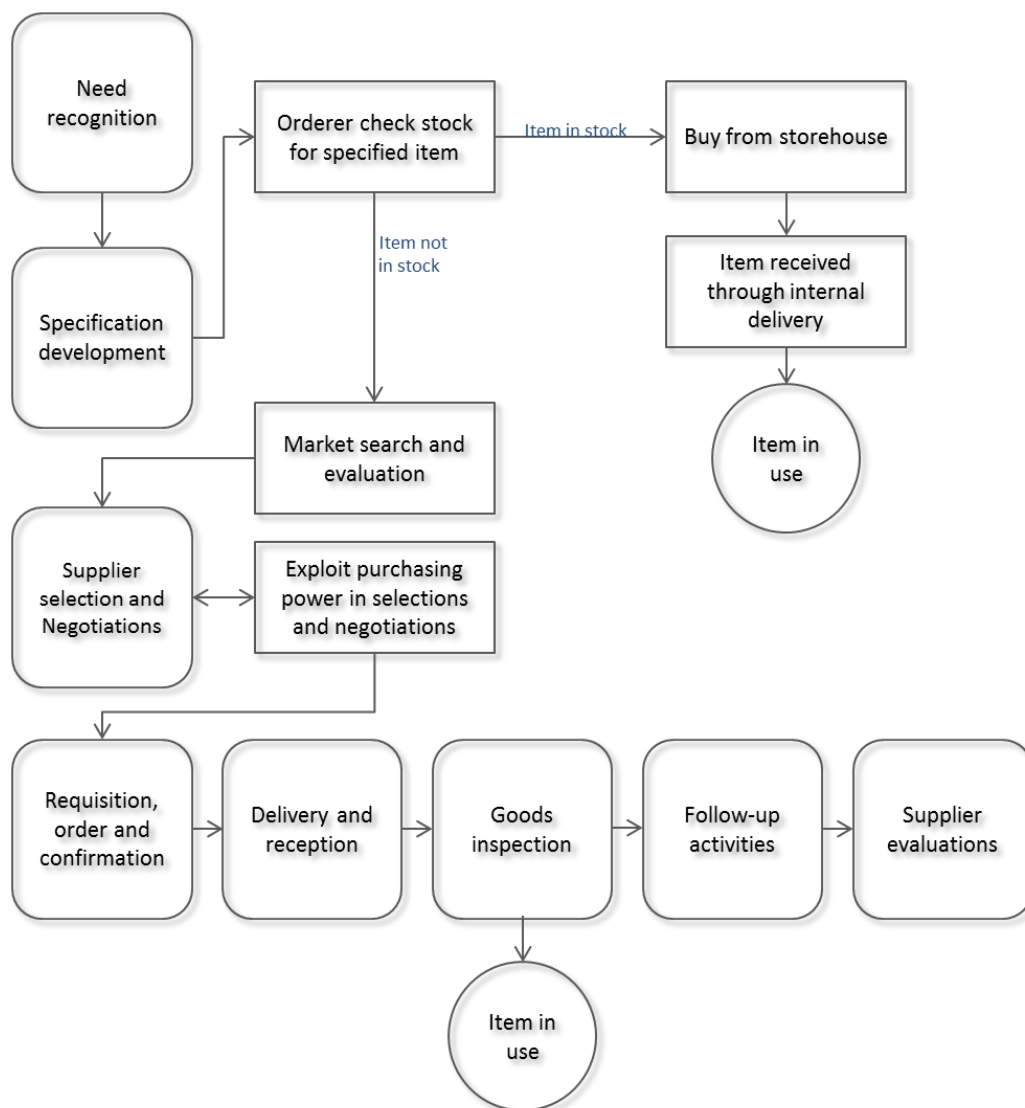


Figure 33. Purchasing process suggestion for leverage items

Need recognition: The need recognition can reveal whether the buying situation should be seen as a new one or a modified rebuy. The leverage items are one of the best categories to try new suppliers in, since the supply risk is lower than for the strategic and bottleneck items, and the company is not bound to the long contracts suggested for the bottleneck items. There is of course the fact that they are expensive and, as always, the quality has to be ensured, but as for a modified rebuy the company should have records on what they can expect from previous suppliers.

Specification development: The question on whether the item is stock-kept or not should be answered also for the leverage items, but it seems like this is usually not the case for those and hence the full process illustration most commonly holds.

This process illustration has a box stating “Market search and evaluation” and this is to emphasize the power the buyer side has for the leverage products. Since the suppliers are many and the financial impact is high the price becomes one of the most important factors. The buyer usually has a chance to separate the cheaper suppliers from the more expensive ones even before they are contacted, for instance from previous experience or from what is heard from other buyers.

Supplier selection and Negotiations: When a sufficient amount of suppliers have been chosen to receive the requests for quotation the best price can be reached through the suggested strategy of competitive bidding. This is not more difficult to explain than that the suppliers, and their offers, are tested against each other and the one offering the best deal is then used. The best deal is here much focused on the price, but it should be kept in mind that the total cost of ownership is what is most interesting. The purchasing power of the buyer and his or her supposedly many bids also enables him or her to negotiate harder. The negotiations have to be well-prepared anyway and preferably in cooperation between engineers and purchasers.

Requisition, order and confirmation: Since the financial impact is high for the leverage items and the buying frequency is not as high as for the previously discussed product groups, it is justified that it is the purchasing department that transforms the requisitions to purchase orders. Also due to the financial impact is that order confirmations should be checked more carefully and preferably the purchasing department should also ensure that the confirmations are received from the suppliers in a timely manner.

Delivery and reception and Goods inspection: Deliveries and receptions of leverage items do not need any specific activities only because they belong to this group, but the same discussion holds here. However, the emphasis on checking the goods is more leaning towards the reason that it is valuable items, rather than they are risky to be without.

Follow-up activities: As the supply risk is low and the suppliers are many and interchangeable, the modified rebuy is commonly seen among the leverage items. To be able to efficiently change supplier there is a need to continuously gather the information required. As stated above, much of the follow-up activities concerns gathering market and vendor data, outside or inside the process, which for instance can be used as an advantage for the buyers when inviting the suppliers to state their bids.

Supplier evaluations: Again, supplier evaluations are important. According to literature, large and important spends should justify more thorough investigations of the suppliers. Another reason for the

leverage items is that this is one way to keep record of suppliers which makes it easier to decide when the question on changing suppliers comes up for discussion.

7.4. Purchasing process for strategic items

As literature suggests, the strategic products are critical both for the production and for the financial results, both for the case company and for the suppliers of those items. The strategic items need strategies that focus on creating long and sustainable relationships with the suppliers. In the case of Höganäs, there is in most cases only one supplier available for each item. A more dependent relationship situation cannot be found within the portfolio model but on the other hand it is usually the same for both parties, which implies that both have an interest in maintaining a good relationship.

What is important is to not lose oversight in the critical situations and not give in for conditions stated by the supplier that are not sufficiently appropriate for the company, and for instance still get prices that follow the prevailing market structure. An activity on the side of the purchasing process is therefore to follow and develop so-called industry cost curves, which for instance can help the company in justifying its arguments if negotiations are needed.

A way of ensuring both a smooth relationship and an efficient process is to involve the suppliers at an early stage, which is done at Höganäs today for the strategic items. This usually leads to a joint development which imposes more (or better) knowledge inputs and also makes changes in the orders more effective since both parties understand and can be aware of the changes. The close relationships usually also focus on pre-planning costs, overall process improvement, increased quality and improved product development. This does not only make the tangible and intangible transactions more effective between the supplier and the company, but also the internal purchasing process more efficient. Keeping such a relationship is however dependent on consistent and frequent information sharing and exchange, including visits at each other's sites.

This is the group of items that may seem to be in the least need for a standardized process since it may look different for each and every purchase and be developed from case to case. This is not true and they are rather the most important items to have structure and procedures for. However, it might require much more work to develop a suitable process due to its critical relation both to supply risk and financial impact. A risk is also that it gets too strategic to be useful on an operational level. But all strategies for the strategic items have to emanate from top level due to their high importance to the company. However, with a cross-functional approach, with voices from different departments and from the suppliers, the strategies should be easier to operationalize.

Top management should also be aware of how the suppliers handle the businesses and what quality they deliver. Even if the items are sole-sourced (i.e. can only be found at one supplier) and a change of supplier is not seen as an alternative, measures need to be taken if they are evaluated as bad in any way, and therefore supplier evaluations are important also for the strategic items.

The strategic items' suggested purchasing process is illustrated in *Figure 34*.

7. Suggested processes

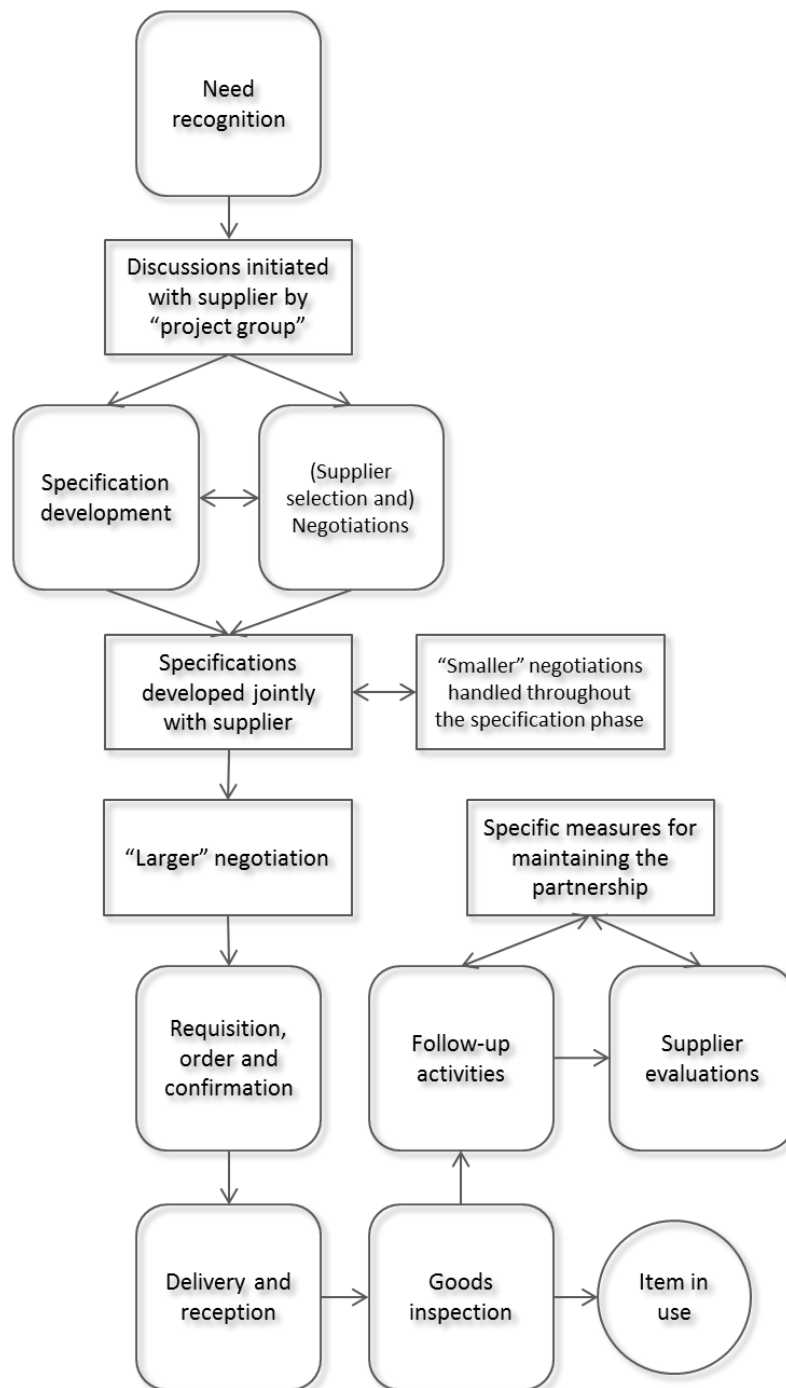


Figure 34. Purchasing process suggestion for strategic items

First and foremost it has to be said that the process of purchasing strategic items at Höganäs can be hazardous to illustrate and describe since it tends to change according to the character of the item purchased, the supplier used, the amount of money involved and the time frame for the project it belongs to. However, some characteristics can be outpointed.

Need recognition: None of the strategic items bought at Höganäs are stock-kept and therefore that question is not applicable in this process. Although the item or equipment might have been bought before, the buying situation should in most cases be seen as a new task. This implies that there is a

large amount of information required in the process, as well as there are many important decisions to make.

The need recognition step is most apparent as a separate step in this process since this is where the company makes the decision on which supplier to start cooperating with. This does generally not mean that this is the supplier that will sell the product in the end. But as of today, Höganäs has established relationships with the suppliers that deliver the strategic items and therefore one can assume that the choice made here is the one that holds throughout the process.

Specification development and (Supplier selection and) Negotiations: With the previous statement the supplier selection becomes irrelevant to discuss within this process. The strategy suggested in literature for the strategic items is *partnership* and to be able to establish fruitful partnerships with suppliers it is only logical that the specifications are developed together with the supplier and as an own process. Naturally, some negotiations are taken care of along the way, but the main negotiation around price, price terms, delivery terms and other legal aspects should preferably be held as a separate session. Due to the importance of the strategic items, the preparation of the negotiations is highly emphasized in literature for those items (although absolutely not ignored for the other product categories). Mainly three issues should be prepared at this stage; making sure of what is wanted and negotiation limits on different variables, state how valuable each of the wants is and their prioritization, and deciding upon entry and exit points. The preparations should be jointly prepared between purchasers and engineers to ensure that the required knowledge is gathered before and at the meeting.

Requisition, order and confirmation: The purchase requisition for strategic items does not need to be handled in any extraordinary way. The orders for those items are usually including a range of items, however. An issue for Höganäs is that their ERP-system cannot handle multi-position orders, which implies both worse efficiency than if it could and opens up for errors being made due to a lack of included information. As for the leverage items, someone has to make sure that the order confirmations are received in a timely manner and that they correspond to the orders sent.

Delivery and reception: In the case of Höganäs it is common that the strategic items, i.e. process equipment, is as large as they are not sent to the goods reception. Knowing whether the goods have arrived or not is therefore not an issue in this case and is not seen as a procedure to discuss or change.

Goods inspection: Transportation damages of the goods might be revealed at delivery but trying out the functionality cannot come before the equipment is taken into use. It is assumed that that the item meets the specified requirements is the supplier's interest as much as the buyer's. Therefore the contact with the supplier should be maintained, but also this is rational since long relationships are created here, aiming at being kept.

Follow-up activities and Supplier evaluations: The follow-up activities for strategic items can apart from including invoice administration, updating and archiving purchasing and supplier files etcetera, also contain evaluations of the whole project. If done properly this can reveal further efficiency improvement possibilities.

To have a proper supplier evaluation for the strategic items or not is not up for discussion in literature – it is a must. Since both purchasing's impact on financial results and the supply risk is high this is the

most important product category to have supplier evaluations for. Since both buyer and supplier should look for the mutual gain, it should not be a problem to have the supplier cooperating for the evaluations. It can to some extent be a matter of willingness to share information, but this has also been done throughout the purchasing process.

7.5. Estimations of efficiency improvements from suggested processes

Any solutions to the research problems handled in this report are not implemented within the time frame of the project. This means that the efficiency aspect will have to be elaborated on with the experience of the participating managers and with what literature states. From the workshop discussions some explicit inputs on whether suggested solutions can contribute to increase the purchasing efficiency were given.

The first and foremost aspect that is assumed to improve the purchasing efficiency in general is to get the process clarified and explained in an understandable and structured way. This visibility throughout the process is said to have a large potential to increase the efficiency for example by preventing mistakes. (Molin et al, 2012)

If the suggestions in this report can help Höganäs, and more specifically the users of the PPE purchasing process, to keep track of and to know about the required inputs, efficiency will be improved. This could for example concern an EU directive for electrical items or the CE-marking and that the standardized process reminds the user when to check this. Without e.g. the CE-marking some things cannot start which implies that time and money are increasing unnecessarily – if this can be avoided it is a distinct efficiency improvement. (Molin et al, 2012)

To have the process clear to all involved in it would also increase the efficiency. If one know where in the process a specific purchase is at the moment and by that also know what has been done and not, one will be able to switch the person in charge of it, which can be useful if anyone get sick or is away because of any reason. It would also make it easier for peripheral interested parties, e.g. the purchasing manager, to check how far a purchase has come, just to get an update. There is, however, also a concern that some steps in the process can be slower due to the fact that much information may need to be checked. (Molin et al, 2012)

An advantage, possibly an efficiency improvement potential, is that one may be able to find the right material faster. For items that do not have an established standard, which then should be used, one may directly know what should be chosen, or rather, one know where to look to be able to decide it, and hence save time. This time saving comes from not having to spend time on searching among old purchasing documents, other's experience and also the large amount of standard choices, i.e. registered items with item numbers. (Molin et al, 2012)

It is also stated by Molin et al (2012) that just to get the solution incorporated in the system as a process map would be an efficiency improvement. The reason for this is that this would be some kind of task description that can be used both as a benchmarking tool for what is actually done and be a part of the purchasing function description.

Connected to the Kraljic idea of categorizing products according to scales of *high* and *low* some concerns are raised. It is seen as a relevant idea but the scales have to be stated in a company specific

manner. It might also have to be specified from case to case and maybe one should use different scales for different products. It is also said that any assumptions made regarding the scales of the dimensions as well as other matters connected to the matrix have to be explicitly stated. (Molin et al, 2012)

7.6. Reflections on practical issues in case of implementation

The following are comments from the managers gathered at the second workshop regarding practical concerns if an implementation of the constructed solution is considered.

With the standardized process maps as the main result, the question arises on whether it is possible to integrate it with the ERP-system. The way the ERP-system is used at Höganäs today does not make it suitable for incorporating a purchasing procedure. It would not be logical since it is not used for, nor does it support, the task of describing working guidelines, but only to insert or get information, e.g. like the described purchase requisition inputs and outputs. (Molin et al, 2012)

However, in Höganäs' Management system, there are already a range of function descriptions and work procedures, in diverse levels of details for different functions (Nilsson, 2012). The work procedures are illustrated as processes and describe the desired way to complete different tasks (*ibid.*). Regarding purchasing, the company has made a distinction between direct and indirect material (Management system, 2011a). Within this division the direct material is described thoroughly and detailed, both concerning how to go through the purchasing process and on how (and most importantly *that*) for example supplier evaluations should be done (*ibid.*). It should however be noted that this does not mean that indirect material is neglected, only that it is seen as less vital than the direct material (Molin et al, 2012). The indirect material procedures and guidelines are described on a higher level and with terms like overall quality and environment and that it should be done in accordance with company directives (*ibid.*).

Regarding any required investments needed for the recommendations to be implemented Molin et al (2012) do not come to think of any large ones, which is anticipated due to the nature of the project and the expected format of the recommendations. There will however be some administrative, or rather IT-related, adjustments needed if it is to be implemented. If it follows or is adapted to today's look of the Management system, no education is expected to be necessary for the employees, this will only be needed if any major changes are to come. Connected to administrative matters, there also has to be an owner appointed, i.e. a responsible person or company function to all processes and documents. (Molin et al, 2012)

8. Discussion

This chapter reflects on the findings from the analysis and provides discussions around them. It begins with the purchased items and then comes the purchasing process. Then a discussion on the purchasing portfolio model and its categories and corresponding strategies follows. In the end a section on the efficiency aspect is provided, which discusses the possible efficiency improvements when adopting the suggested processes.

8.1. Purchased items

It is apparent that a proper definition on what PPE purchases are is a fundamental cornerstone in being able to state suitable purchasing procedures for them. Höganäs has in their management system a division between indirect and direct material. Specific and clearly defined definitions on these cannot be found, but what is clear is that PPE purchases cannot be equated with indirect material. For future and further development of the process descriptions a more specific definition might be needed.

Höganäs is not intentionally using a product classification like the two-dimensional Kraljic matrix. A part of its logic thinking is used when separating their products into the different item groups with items that can be handled in different ways, but it is still only in one dimension and the handling is just operational. A pronounced strategic use of those groups does not exist, since they are not explicitly connected to any specific purchasing strategies.

An update on the scope of the study is suitable here. Even if the item groups would have been used more strategically it would not have solved the entire issue with the PPE purchases, which is the scope. Since the item groups cover each and every item with registered item number at the company, it is not seen as good starting point for this research.

8.2. The purchasing process

8.2.1. Adopting the process view

As discussed in literature, all activities made to complete a specific task, e.g. a purchase, are in one way or another related to each other. This is why it is difficult to discuss one question without touching upon another. This is why different activities do not allow to be set totally isolated from each other. And this is why an overall process view is useful to adopt. If the activities were to be analyzed separately for e.g. improvement efforts it is assumed that there would be both lost opportunities due to the lack of the full picture and a risk for sub-optimization.

Theory also states that the different activities within a process take place after each other in time, which can be the case even though they are interrelated, but what has been revealed by studying practice is that this is not always the case. Some activities both can and should be conducted overlapping each other. Others may both change location in the process and look different due to the characteristics of the inputs, process enablers and guides, and the preferred output. The organizational set-up and the involved individuals are other factors affecting the process' appearance.

From this case study it is also apparent that some activities are processes in themselves. One example is the explicit purchasing example of a control system, one of the most advanced equipment. Being

developed together with the supplier, the specification is a process in itself; discussed, changed and sometimes even tested before the purchasing process can continue. This is one matter that points at the fact that it is difficult to set clear boundaries between the purchasing process steps, since many overlap each other and some are even recursive.

But adopting a strict process view also implies that one cannot be very specific. The level has to be adapted to what one intends to examine. If some kind of overall improvement is the objective it would be natural to adopt an overall view and not examine the details. But it should also be emphasized that one cannot talk about the whole process all the time. To be able to find clear improvement possibilities one should at least study the different steps a process can be divided into.

Somehow there must be an optimal way to both place the activities within a process and to perform them. Developing such process maps and procedure descriptions for the purchasing activities is one of the core elements of increasing the purchasing efficiency – the difficulty lies within finding the right balance between the process view and how clear the process steps should be defined and separated.

8.2.2. Process steps and activities and the adapted purchasing process

One of the findings stated in 6. *Analysis* was that the described theoretical process has too few steps to appropriately describe a process of PPE purchases. The amount of steps revealed at the company is clearly larger than any of the process descriptions found in literature, and with the support from those many previous researches, the described steps within 5. *The case company* can be said to be too many. The most apparent reason to this is that the level of detail it implies to have that many steps can make it difficult to use the exact same basic process for all purchases.

The differences between the theoretical purchasing process and the suggested, and adapted, purchasing process is above all the first and the last steps. The author wants to include the first step, *Need recognition*, which is not emphasized in literature, where the arisen need should be thought through since this can determine what the contents of the purchasing process is going to be. The last step, *Supplier evaluations*, is on the other hand highly emphasized in literature but is not very developed at the case company. It deserves a separate step because of its importance, not least as a part in creating an efficient purchasing process.

8.3. The portfolio model

8.3.1. The product categories

If the time limit for this project would have been different the natural thing would have been to go through all the items, sort out which are production process equipment and then group them. A potential difficulty in using the matrix is that Högånäs have so many different items, which can make the matrix too large to handle in practice. On the other hand, this should be overcome by dividing the products into the different categories, which is a tough and time-consuming work, but if done properly only needs to be done once. However, in the data collection of this project, a very suitable categorization was developed that is both relevant for further portfolio model discussions and is only covering the PPE purchases (articles, specific parts, manufacturing parts, and special machines). If one would start to group all PPE items into four specified groups, it seems very possible that those same groups would have been discovered.

The appointment of *high* and *low* within the matrix is an important topic that has to be thought through carefully. The fewer groups that are used, the easier it is to appoint their scales, and especially since this can be done in relation to each other group. Thus, with this simplest two by two matrix the supply risk and the impact purchasing has on financial results will be right if the characteristics of the product groups are rightly understood, although it is close to guts feeling. If a refinement of the matrix should be done however, for instance increasing the product groups to 16 and create a four by four matrix, a framework for determining the scales is needed – both for the matrix itself and for the specific groups. It is most unlikely that all purchased items within a company allow a categorization of this kind, or at least an appointment on either axis, unless there are factors or characteristics that are possible to transform into measurable numbers. If such a framework could be developed it would also be possible to place a certain category in the matrix independent on the other groups. What is clear is that the development of a refined purchasing portfolio model would have to be company specific and does not allow for generalizability to any large extent.

8.3.2. The corresponding strategies and other strategic implications

The four product categories got their corresponding purchasing strategies according to what has been developed and described in literature. In relation to the analysis of the buying objectives of items (Höganäs' suggested function division and Robinson's (1967) buying situations) it was however suggested that this can be used as extra strategic layers on the processes. The main difference between Höganäs' suggestion and Robinson's, is that Robinson talks about what kind of buying situation one is standing in front of and the case company talks about characteristics of the arisen need, i.e. needed product, and hence literature is more on a strategic level and the company is leaning towards an operational level.

The extra strategies has however not been examined in this project but deserves a thought in case of an implementation. *Figure 35* is an attempt to illustrate the changing focus areas as the type of buying situation changes. An increased (or decreased) strategic level means a movement of the focus in a range of areas and this could be visible in the way the strategic purchasing processes are designed. Apart from financial impact and supply risk, the level of specification required is an important influence of how a purchase is handled. The figure gives a range of examples of strategic implications.

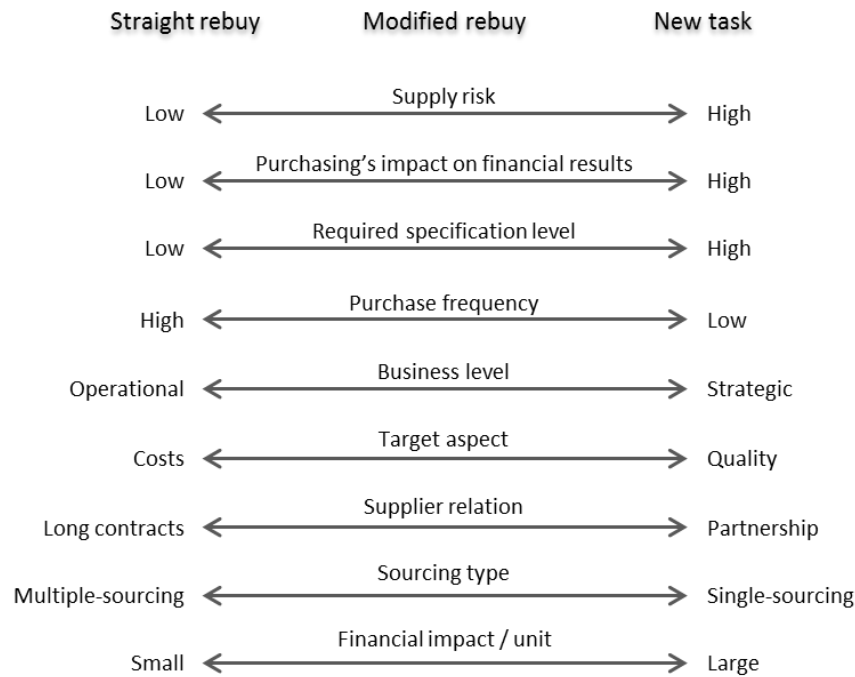


Figure 35. Changing focus areas with changing buying situation

It is important to keep in mind that using portfolio models has to be anchored both in the overall purchasing strategy and also in the overall business strategy. Many references can be found in literature that point at the connection between a company's success and its alignment of strategies on different company levels. It has also been said that the performance levels of the purchasing function affects the performance of the overall business. This connects in turn to the more and more emphasized importance of the purchasing function, i.e. the saying that purchasing possesses a strong potential to be a contributor to a company's financial success. That is why this department should be involved in the strategic directions of the company. It is believed that one of the advantages of standardization is that it makes it easier to reach this alignment.

8.4. Efficiency improvements from process standardization

As stated in literature, efficiency and effectiveness are different aspects and signify different capabilities. This may imply a trade-off between the two when a company tries to focus on either of them. It is also said that an efficiency focus lean towards costs and productivity while effectiveness focus on quality and value. It is true that one of the main objectives of standardizing the purchasing processes is to make them flow better with less errors and uncertainty, which is another way of describing an increased productivity. The author would however argue that by using standardized processes a company can increase the quality. An increased product quality delivered to customers may be too farfetched but a better flow of processes would presumably affect other parts of the company in a good way. Another argument is that the time gained with more efficient processes can be used to ensure its quality even more. The balance between effectiveness and efficiency is affected by the line of business but mainly it has to be determined by the company's chosen business strategies.

In the literature it is stated that purchasing portfolio models help companies to standardize the way different product groups should be managed. Since the strategies connected to portfolio models

usually do not get very specific and enables a differentiation of the strategies there is room for adaption to the companies' specific requirements. This was kept in mind when deciding to use the four categories suggested by Kraljic (1983).

It is believed that it might not be suitable to standardize the purchasing process in one single way since the items purchased can have very different characteristics. It might neither be relevant to state more than four processes since the author does not have more ingoing knowledge about the purchasing requirements at Höganäs. Nor is it in this phase of the constructed idea of the solution believed that the efficiency would increase by developing more processes.

Efficiency aspects regarding the four different processes have been mentioned in connection to their descriptions in the previous chapter, and in the following the more overall efficiency improvement aspects are described.

8.4.1. Structured procedures

Within the frame of the so-called second workshop (explained in 3. *Methodology*) managers from different departments of Höganäs discussed and estimated the possible efficiency increases of standardizing the purchasing process of PPE purchases (see 7.5. *Estimations of efficiency improvements from suggested processes*). One of the most emphasized aspects for efficiency improvement was the clear structure a standardized process can bring. This is also outpointed in literature by many different researchers and academics, which has been described in 4. *Theoretical framework*. It is said that process standardization makes the businesses less difficult to operate when the tasks and activities are specified, which really is the main objective of process standardization.

It was apparent that stating how the process for PPE purchases look like today required long discussions at the workshops, mainly because it seem to look slightly different each time and because experience is the basis for conducting a PPE purchase. The author springs to mind the similarities of describing how to do when to drive a car (with manual gearbox). Everyone who can do it knows where the pedals are and their names, but finding the tensile mode is a matter of experience. As literature explains; there are usually more than one method used if the same process is completed by more than one person, and this affects the results and its consistency Most people with a driver's license can go from a to b but how efficient it goes can differ depending on guides (e.g. maps) and enablers (e.g. type of car), as well as the final results appear (e.g. if one is on time or not).

As frustrating as it can be to not be able to describe the exact way of how to get the car going, it is equally frustrating for the person how wants to learn how to drive a car – one do not want to hear that it is based on experience when one is not possessing that. In the view of the author it is obvious that there is a way to describe how a task can be optimally done, whether how it is to keep the pedals of a car to make a smooth start or whether it is how to purchase PPE items. Standardizing a purchasing process means in literature that a single method of how to perform a task is outpointed, i.e. that the task will be performed in the same way each time it is carried out. It is not only emphasized that variations can be decreased and activities that re-invent the wheel are limited, the possibility of errors is also reduced. This was also stressed by Höganäs as one of the possible advantages of standardization. As if this was not enough, literature (e.g. Sánchez-Rodríguez et al, 2006) also points

at the fact that standardization can lead to finding the root of the problems in the process, and how changes can be implemented to prevent the errors to appear again.

8.4.2. Decreased dependence on people's experience

The author wants to stress that by the statements above is not meant that only because it is possible to describe a process in its optimal way there is no need for experience. It is assumed that all work tasks can be performed in a better way if experience is possessed. It is also suggested in literature that the right balance between standardization and required variation due to specific characteristics, and between centralized control and distributed independence, needs to be found. The importance of this balance is understandable but assumedly cannot be found without trying the standardized processes out. This is also where the possible downside of process standardization – lack of innovation – can be connected. Employees can feel like their innovative ideas of improvements are restrained, but, as discussed earlier, a company cannot manage having as many working procedures as persons performing the task. This is therefore also a matter of finding the right balance, and as literature suggests; a minimum level of requirements can be set by the process standardization, while innovation can refine and improve them.

The literature says that when a process gets standardized the dependence on knowledge and expertise of individuals can be removed. The author believes that this to a large extent is true and it is not only a lack of consistency that the dependence on individuals' personal experiences can bring. With the fact that experience is used when conducting a PPE purchase at Höganäs, especially in the specification, request for quotation and supplier selection phases, comes the issue with not having very much documented data and information. This makes the decision-making throughout the process more uncertain and is presumably affecting the efficiency in a bad way.

Information or knowledge easily can disappear, for instance if a certain person is absent (leaves the company entirely, staying home sick etcetera), but also by being more and more eroded when transferred from person to person. This implies that a person might believe that he or she possesses the knowledge but through verbal transfers it can have become distorted and more or less incorrect. A risk in looking at the latest purchase when trying to decide upon a new one is that this can have been conducted many years ago, hence this information can be out of time in different aspects. It was emphasized by Höganäs that if the person who wants to buy anything knows what to look for and where to look for it throughout the process the purchasing efficiency would be increased, and this seems to be in line with what literature suggests.

8.4.3. Enabling of measurements

Another side of relying on experience and not keeping proper records of for example vendor ratings, reliable statistics over different items purchased, approved or unapproved suppliers, or specific purchasing spends, is that it gets more difficult to put different aspects or activities in relation to each other and determine their relative importance. It can in the suggestions of this report be described that certain things are important to consider, but it is difficult to make any prioritization on where to focus the efforts. One may come to think of questions like the following:

- How often does it happen that a supplier that by one buyer was experienced as a bad cooperator is used again by another buyer?

- How often is something bought straight from a supplier instead of from the warehouse, and when can this become a problem?
- Would it be faster, i.e. more efficient, to order from the internal warehouse instead of from the supplier (and hence it would become an inventory management issue)? What is the inventory cost contra the cost for waiting for an item to be delivered from the supplier (i.e. when do time become money)? And what is the cost for developing the specifications every time the item should be ordered from a supplier?
- When (e.g. after how long time) does it become a problem that either the buyer or receiver does not get to know that an item has arrived?
- How often does the company pay for the wrong quantity of items due to the fact that the invoice is paid long before the package is opened and inspected?

All of these questions cannot be answered by keeping purchasing records (and are only examples) but it is assumed that these types of questions have a clear connection to keeping track of activities and their outcomes. In several literature references it is said that standardization of processes can be a basis for the development of performance measurements and thus that it also enables comparative measurements. Since explicit measurements or KPIs is not apparent for the PPE purchases, a standardization that enables and develops measurements that can be used for improving the process is assumed to increase the overall purchasing efficiency.

8.4.4. Enabling of consistent documentation

One requirement, stated in literature, for the decreased dependence on individuals' expertise and experience mentioned earlier is that documentation of procedures, standards, work instructions, and guidelines will be developed. When standardized processes are turned into operating instructions, it is said that a company can reach both a solid base for finding improvements and have working procedures that are easily updated if needed. Höganäs also pointed at this efficiency aspect; if proper task descriptions can be developed they can be used as both benchmarking tools and as function descriptions, it was said.

Another fact that cannot be neglected is that if the purchasing process and its working procedures are documented, new employees can get into work faster and have a guideline to lean against (as with the example of driving a car above). The documentation can be extended very far and for more or less specific activities, but it is important to keep in mind that it should not be overworked and not pass the level where stated guidelines may start to harm the innovative power of the employees.

One concern found in the analysis was that the handling of purchase documents is not always satisfactory. Related to purchase requisitions, purchase orders and order confirmations are that there is a lack of traceability of the documents. It was said that files concerning one purchase cannot be attached to each other. The reason for this can for instance be that the requisition is created in the ERP-system, a drawing can be sent to the purchasing department for forwarding to the supplier by e-mail, and the order confirmation can be sent as a pdf-file to the buyer from the supplier. It is not difficult to realize that there is a potential for errors being made when an uncertain number of different documents should be connected to a specific purchase. This kind of issue is not specifically remedied by standardizing the purchasing processes but it is highly connected to being able both to collect all

documents concerning one purchase, (and being able to see the whole purchase e.g. two years later) and to build up a purchase database.

Other documents related to the PPE purchases are, as mentioned in 5. *Data collection*, for instance machine directives, CE-marking and the REACH directive. Any collection of such documents was found to not exist at Höganäs, but to create it is seen as a step of standardizing the purchasing processes, i.e. specifying procedures. It would increase the efficiency both by having the buyer know which aspects to look for by examining this kind of checklist, and decreasing the possibility of forgetting anything. It would thus be a matter of time-saving if the buyer is not sure of his or her knowledge, and when teaching new employees or consultants.

Another issue that today also is handled by means of experience is that both a so-called black list of suppliers and a list of approved suppliers are hardly existent within the process of PPE purchases at Höganäs. Incidents that could make a supplier end up on such a list are based on local experience. This means that one buyer can have experienced a bad practice from a certain supplier but this is not transferred to the common knowledge at the company as a total. Hence, the same mistake can be made again by a different department, buyer or purchaser. The same situation holds for suppliers that have proven to be good – no approved suppliers list exists in any central or overall form. The problem is apparent at the step of supplier selection and should be remedied at the step of supplier evaluations. To not evaluate the suppliers implies that a list of preferred suppliers, or a black list of suppliers, cannot be developed in a consistent and quality assured way. To get away from experienced-based decisions regarding supplier selection, or to be able to put the selection decision on a newly employed, some kind of printed reference is needed. A record of supplier evaluations is also useful when initiating new supplier relationships. The company would then have black on white on what they at least should demand from new suppliers in terms of requested capabilities, i.e. it could be some kind of benchmarking tool.

The efficiency aspect of this issue is that if those lists were created and used, both time-consuming problems of handling bad suppliers and discussions on which actually is the best supplier to choose for a certain purchase can be avoided. A standardization of the processes implies that it should be apparent when and how to perform the supplier evaluations and how this affects the lists of suppliers.

8.4.5. Enabling of organizational improvements

At the efficiency discussion with Höganäs it became clear that the managers expect that the purchasing efficiency will increase if a standardized process gets available to all involved. To know where in the process a certain purchase is at any time, which should be equal to know what has been done and not, decreased the dependence on specific persons completing the purchase. Literature also states that a standardized process is easier to communicate and allows smooth handovers of work tasks if needed. It is also said that it improves the collaboration within the organization due to the clear descriptions.

Literature also suggests that purchasing managers can save money through purchasing standardization since the time-savings gained from it enables them to spend more time on non-routine activities. The author believes that it is not only the managers but also operationally working purchaser that saves time on standardization. If less personnel is needed, for example if non-critical items are handled through e-procurement solutions, their time can instead be spent on e.g. more thorough market investigations and supplier evaluations.

8. Discussion

Within this section it is appropriate to also reveal the thought of a potential downside of process standardization. If not handled properly, the standardization might increase the bureaucracy or the purchasing procedures. This could imply inefficiency in that more rules and guidelines should be followed, which instead consumes time. It is believed that this is matter of balance between standardization and individuals' decisions, and might be most apparent while the standardized processes get implemented.

Connected to organizational matters it is believed that it is important to state the responsibilities for the different purchasing activities to be able to achieve a better organizational efficiency, e.g. through an improved cooperation between the technical department and the purchasing department. This could also include statements on where or when to connect the purchasing department to the purchases. It would not be logical to involve the purchasing department in every purchasing step for every purchased item, but one could set up guidelines for where this department should be a part. Limits for if purchasers should take part from the very beginning could for instance be related to the price of the purchase, the amounts of items purchased, or persons involved in a project, which is an indication on how important it is to the company and in the extension the included purchases.

9. Conclusions

This chapter concludes the findings of the report and connects back to the initial purpose and research questions. Some reflections on used methods are then provided as well as the study's limitations. Then the research implications are pointed out, divided between theoretical and managerial such. The chapter ends with actions recommended for Höganäs to take and some thoughts for future research within academia.

9.1. Findings

9.1.1. Portfolio models and purchasing processes

Using the purchasing portfolio model as a tool for the process standardization was motivated by the logic need for differentiated purchasing strategies due to the different characters of the items. Purchasing strategies and the way to illustrate the purchasing process do not necessarily have a clear connection but as the importance of communicating the strategies has been emphasized in literature, this is a way to anchor the strategies down to the very operational level. It was said in literature that portfolio models are effective tools for creating differentiated purchasing strategies that are aligned with business strategy, and this is believed to be true since it evidently has received more and more attention both in the academic and in diverse business fields.

A look at the theoretical way to describe a purchasing process (in 4. *Theoretical framework*) reveals that there are many ways to do it. It has also been shown that in practice there can be yet another way. However, Höganäs knows what should be done by experience and this has converged to be close to the theoretical purchasing process. But since the process appearance is dependent on experience it may be more difficult to know what to do in a new situation or when something does not go the way it was planned.

A conclusion that can be drawn from studying the theoretical processes (namely van Weele's) and the practical one at Höganäs is that the basic reasoning behind the theoretical one can be used as a starting point and to establish the basic picture of the process wanted. Thereafter it has to be adapted and developed according to the specific requirements and needs of the company. It was thus concluded that one cannot use only one standardized process for items that differ as much as the PPE items do. A suggestion for differentiated but standardized processes, which answers the first research question, i.e. *what a standardized process can look like with the example of Höganäs*, has been shown in figures 31 to 34 within 7. *Suggested processes for production process equipment purchases* and discussed in connection.

It has been seen that even though one manage to differentiate the different activities into specific steps in theory, the same distinctions could not be found in reality, presumably since it is much more complex than theory. Activities usually overlap each other, can be recursive and iterative and are not as straightforward as in theory, this holds for example for the specification phase. It can also be concluded that the purchasing process itself is not an isolated part of the company and its other processes, and should not be, since increasing the efficiency also is dependent on good communication between all parties involved. The purchasing function can neither be isolated from the rest of the company due to purchasing's need of being a part of the overall business strategy.

It has been argued that business decisions by nature are more complex than what can be handled by the rather rough supplier strategy recommendations suggested by portfolio models. First and foremost this critique points at the fact that there are only two dimensions in the matrices, which makes it impossible to make clear enough strategic statements. After this study, the author is willing to agree; it seems unwise to make strategic decisions based on only those two dimensions, since there is so much more to consider. Another, very apparent, weakness is the models' scales are determined in *high* and *low*, which seems very unscientific. This may not be a problem for the extreme items, but raises a concern for the ones close the boundaries between product groups. It is believed that this has to be overcome by users stating which factors are most important and how they can be evaluated. Preferably one should develop an evaluation form where a single item can be placed in the model without comparing it with others in terms of *higher* and *lower*.

This discussion leads to the question on how risky it can be to place items incorrectly and thereby treat them strategically or operationally wrong. How large impact can an incorrect placement bring? Further on, what can a company do to move items in different directions within the matrix, independent on whether it is placed right or wrong from the beginning? Since internal and external factors change continuously, the prerequisites for making the placement decisions presumably change as well, and this is clearly not an aspect that is taken into account in the portfolio model used in this study.

The relationships with the suppliers and the power balances between the company and its suppliers can also be variable. One of the dimensions in the portfolio model is clearly related to the supplier side but the critique regarding the neglecting of suppliers can be understood as the dimension only incorporates factors from the company's side. Involving the suppliers would however imply two things; it would make the whole thing much larger and it would raise many questions about information sharing. It is believed that companies' may not want to share all the required information (nor the suppliers) and the workload could be seen as unnecessary the less strategic the suppliers are.

Placing a company's products in a portfolio model is therefore seen as a good starting point and, as stated in literature, a facilitator for decision-making. The rough maps can be drawn with those tools but more specific decisions are difficult to make, so it's recommendations has to be further developed, elaborated on, discussed and agreed upon in a consensus mode.

9.1.2. Efficiency and standardization

This project has examined the possibilities of increasing the purchasing efficiency by stating how the purchasing process should look like each time it is gone through, i.e. standardizing it. One of the delimitations stated that the scope of the project does not allow for implementation of the ideas and therefore the performance improvements are stated on a theoretical level. With this in mind it can be concluded that standardizing the purchasing process of PPE items at Höganäs can bring several benefits and impact the purchasing efficiency in a positive way.

Efficiency can be talked about at different detailed levels and with different time preferences. This project has mainly focused on the large perspective, i.e. the strategic. There are fast efficiency improvement measures that can be used to experience both decreased lead times and positive money flows. In the case of Höganäs, one example could be to in the largest extent use stock-kept items when the purchasing needs arises. This would imply a faster process and free up capital from the warehouse, but on the other hand one should ask what it would mean to costs and quality to at some point be

without a specific item. Inventory management is not a part of this project and hence the author has little insight into how this is handled at the case company, it is however believed to have a strong connection to purchasing performance and should be a part of the overall planning of purchasing and stock-keeping.

The second research question asked *what benefits and efficiency improvements a standardized purchasing process can bring, specifically in the case of Höganäs*. The most prominent advantages coming from the process standardization at Höganäs are argued to be:

- Structured processes; the standardization in itself brings an understanding of the operational procedures, both for people involved in it and for people needing an insight into it.
- A decreased dependence on individual's experience; since experience is the main mainstay for the PPE purchasing process at Höganäs it is also very dependent on the employees. Also on that the same person has to be involved in the whole process since he knows what has been done and not. With a standardized process, "everybody" should know what comes next and the dependence on single persons is decreased. It should be emphasized that getting rid of experience as such is not a part of the recommendations since this naturally is a value for the company, however the experience can be instead be used as an innovative power when the employee can move its focus from standard routines to instead be used for refining the processes and increasing the quality and efficiency further.
- Enabling of measurement; being able to measure the performance of a business function also makes it possible to know whether activities made to improve it actually work. It should also get clear where the company would gain most when allocating its resources.
- Enabling of consistent documentation; documentation is a part of standardization's nature so it can be difficult to state what comes first, the chicken or the egg. What can be said is that the documentation required and enabled by the standardization makes it easier to change and update procedures, it can be a help in finding the right procedures and also in finding improvement possibilities when put into print what is done or should be done. Keeping the documents that are created throughout the purchase processes in an orderly manner also enables traceability as well as internal and external evaluations.
- Enabling organizational improvements; the organizational efficiency is likely to increase with standardization due to the fact that the processes are easier communicated and it allows for smoother handovers within the processes. The collaborations between people may improve when all understand the process. It also makes standard tasks less time-consuming and thus, non-routine work tasks can get more attention.

With the illustration on measurement areas in mind (*Figure 17*) it is however believed that only standardizing the procedures and policies will not bring all the benefits. Measures have to be taken on the way of working, the managerial view of purchasing and the use of related information systems.

9.2. Reflections on used methods

Using the constructive approach as an overall methodology for this study seemed appropriate in the study's initial phase since it would give a connection between, and an overall frame for, the ingoing methods. This proved to be right and has above all given a suitable structure not only to the study but also to this report.

The case study was chosen primarily due the fact that gathering case specific information would be required and done mainly through interviews. This method served the study as intended and would be chosen again if this study were to be re-done. Discussing whether a single-case study was appropriate, rather than a multiple-case study, seem irrelevant now at the end of the study since there was not much of a choice in the beginning. By having the purchasing process as the unit of analysis, including more cases would require including more companies. The study would then be more of a benchmarking study and due to the timeframe this would imply a much less detailed level and a networking effort exceeding the time limits. A single-case study has anyways proved to work for this kind of study and would be chosen again.

9.3. Limitations

The main limitation in this study has been the timeframe. A difficulty was related to finding the right balance between depth and width of the area of purchasing. The deeper the investigation goes, the more detailed and explicit can the analysis of e.g. the different purchasing steps be. The wider the investigation is, the better overview and holistic descriptions of the whole process can be provided. Including whole processes was a clear choice from the beginning and with this as the starting point, a sufficient balance was found that proved to be an interesting research level, i.e. leaning more towards the strategic level as opposed to intentionally also including the tactical and operational level.

Another limitation is that the gap between what is stated in this report and an actual implementation seems large. It will require more investigations in the case company, from examining the PPE items to be able to make a proper categorization to deciding upon both overall and specific purchasing strategies that suit Höganäs from all possible perspectives. That any implementation has not been done also implies that the efficiency improvements stay on the theoretical level, although substantiated.

The findings and the constructed solutions are representative to the extent to which they use the general theoretical propositions, and this extent is seen as large in this study. However, it is a specific company that has been used for the study and therefore the more detailed characteristics have to be removed to make the solutions entirely generalizable.

9.4. Research implications

9.4.1. Theoretical contribution

This research has connected two well-established and well-examined areas within purchasing research; purchasing processes and purchasing portfolio models. Although strategies of how to complete purchases presumably effect any creation of process suggestions, explicit connections between the two areas have not been found within the frame of the literature study in this study. The theoretical contribution is therefore focused on the explicit connection between purchasing strategies and processes, and the attempt to point at the importance of keeping a view that includes the both.

9.4.2. Managerial implications

It has been shown that purchasing strategies can be incorporated in the structure of the purchasing processes for PPE items at Höganäs. By justification from literature it has also been stated that if the processes are standardized taking those strategic implications into account, there are several

improvement possibilities available that rationally would increase the purchasing efficiency compared to today. Though, the implications given are on a pure strategic level which makes it difficult to connect it to the hands-on activities performed throughout the process. However, as discussed above, determining the (“best”) structure of the purchasing process and placing the products in a portfolio model to find differentiated processes, i.e. strategies, should be seen as a foundation for further discussions.

Hopefully, bringing up the theoretical view of purchasing processes and purchasing models or strategies, as well as describing the benefits of using this to standardize the way purchasing is done, can be an eye-opener to the possibilities of improving the efficiency. Another eye-opener may be that the issues existing in the purchasing process today have been pointed at in a structured way, and has for instance shown that experience is a mainstay throughout the process and that this can be a reason for unnecessary inefficiency.

The basic process illustration was shown in *Figure 26*. From this illustration, four processes for the different product categories were developed, mainly in the sense of where in the processes to adopt the different strategies (*Figure 31 to 34*). The constructed solutions point at the possible efficiency improvements within purchasing of production process equipment for Höganäs. By creating differentiated processes for different item categories, the purchasing strategies can be utilized to a larger extent than if strategies should be used in an arbitrarily and unstandardized way. This result in greater efficiency improvements than if only constructing one process, even though the PPE items would be in focus. The suggestions are provided on a theoretical level, but are still able to give Höganäs a practical contribution on the strategic level.

9.5. Further actions

9.5.1. Suggestions for Höganäs

The items in focus within this study have been the production process equipment items. It was however not very clear what the definition of those items is. If Höganäs is to have separate purchasing processes for direct material, indirect material and production process equipment, a well-formulated definition that separates those groups is needed.

Although leaving the strategic level to try to reach the tactical and operational ones has been discussed, there is much left to examine and discuss on the strategic level. If the thoughts of portfolio models and standardized purchasing processes are to be implemented, i.e. it is decided to use different purchasing processes for different PPE item categories, one of the most prominent topics regards the measurement issue within the portfolio matrix. The importance of stating how the dimensions (supply risk and financial impact) should be measured, i.e. regarding which factors should be evaluated and how important they are in relation to each other, have been emphasized, as well as the scales (*high* and *low*) of the dimensions. For instance; the financial impact on results from purchasing can be calculated in a countless different ways. Should it be isolated within the purchasing function or compared to the whole company results? Is it connected to purchasing’s impact on product costing? How can different volumes be considered? (See *Table 5* in *4. Theoretical framework* for more examples.) One should also keep in mind that this project concerns PPE items and when for instance leverage products are mentioned as more expensive than non-critical products (and therefore are in a larger need for e.g.

supplier evaluations) it is within the frame of PPE items – it might be that they are low in price compared to other areas, e.g. direct material.

The dimension analyzes depends on characteristics of the company, characteristics of overall purchasing strategies, supplier characteristics and the PPE items and should be decided upon in consensus between a sufficient amount of decision makers to get away from subjective and arbitrary conclusions. A tool that could be used for setting those priorities is the so-called analytic hierarchy process (AHP). This has not been mentioned previously in this report and is therefore only a hint or suggestion for taking these overall project ideas further. It is however a tool that can include both qualitative and quantitative data and “*scores or weights alternative courses of action based on the decision makers’ judgments of the relative importance of the criteria and the extent to which they are met by each alternative*” (Lee & Drake, 2010, p. 6655).

If an implementation is decided, the author would emphasize further activities on a collection of matters. The first one is to take actions to make the strategies reach all the way down to the daily operational purchasing. Not only by making explicit process maps that can be seen in the ERP-system but also to actually communicate the ideas, and maybe most importantly explain them. People are reluctant by nature to changes, even small changes, if they do not understand its purpose. As efficiency relates to purchasing organization and within this personnel, management, procedures and policies and information systems, it would be unwise to leave any of these areas behind.

Another recommendation is to initiate discussions regarding if and how strategies should be developed for actively try to move items to strategically more attractive groups in the matrix. An example would be to move bottleneck items and strategic items (the right side of the matrix) to a lower level of supply risk. On the other hand, there can be reasons for moving leverage items to the more strategic ones. And there can also be reasons for moving non-critical items upwards in the matrix to e.g. reach a better bargaining position towards suppliers.

The strategic attractiveness also includes the considerations around the suppliers and the supplier side. As discussed earlier in this chapter and among the critiques against purchasing portfolio models in 4. *Theoretical framework*, this is not emphasized in the model used. Nevertheless is it an important discussion topic and another thing the author want to point at. How should suppliers be treated? What is different between the product groups? What kinds of relationships are wanted? What are needed? Which is the most appropriate level of information sharing? Whether one chose to cooperate with suppliers or not, in any case it presumably cannot happen before the company itself knows what to do, additional information regarding the suppliers can presumably only increase the exactness of the item categorization and thereby refine the procedures and processes.

As increasing the purchasing efficiency was a part of the purpose of this research all recommendations and statements are in one way or another attempts to do this. That they do increase efficiency has been theoretically justified but the range of improvement cannot be evaluated due to the lack of earlier measurements, which in turn is due to that PPE purchases have not been a separately handled purchasing area. However, now that the thoughts of having this exist, Höganäs is recommended to develop and establish performance measurements, i.e. purchasing KPIs. As discussed earlier in the report, this would enable goal-setting, comparisons to past performances, indications of where allocate resources - in other words; make efficiency more hands-on. It would be beneficial to develop those

before any implementation of strategic processes, to be able to in numbers see and compare how much the efficiency actually can be or was increased.

The importance of documentation and its logical connection to standardization have also been discussed. A specific recommendation regarding a small part of the documentation is to develop a checklist over the documents, laws, regulations, directives, internal and external standards and so on. Within the checklist it should be clear where in the purchasing process the different aspects should be controlled, applied for, asked for from the supplier or whatever it may be, and also where it can be found. This checklist can be especially useful for persons who are new to the purchasing of PPE items. Preferably there should be one checklist for each of the strategic categories of items since for instance the amount of required documents differs between the categories.

The responsibility division between the purchasing department and the technical department was discussed. It was revealed in the data collection chapter that sometimes there are uncertainties on whether some specific parts should be performed by someone at the purchasing department or someone at the technical department. Although the author strongly advocates process thinking rather than function thinking in the topic of the PPE purchases, it is also believed that making the responsibility division clearer would be beneficial for efficiency improvements. The distinction does not necessarily need to be drawn between those departments though, but it seems like when a task do not have a stated responsible person or function there is a larger tendency that things are not done in the best possible way. There are presumably many topics of this organizational kind that can arise while an eventual implementation of the strategic changes is conducted. Such issues can have a large impact on efficiency and its importance should not be underestimated.

A compilation of the concluding recommendations, beside the one to actually use the different purchasing processes for the different product categories, can be found in *Figure 36*. Any specific order of the activities is on purpose not stated since this have to be decided along the way and several of them need to be done simultaneously.

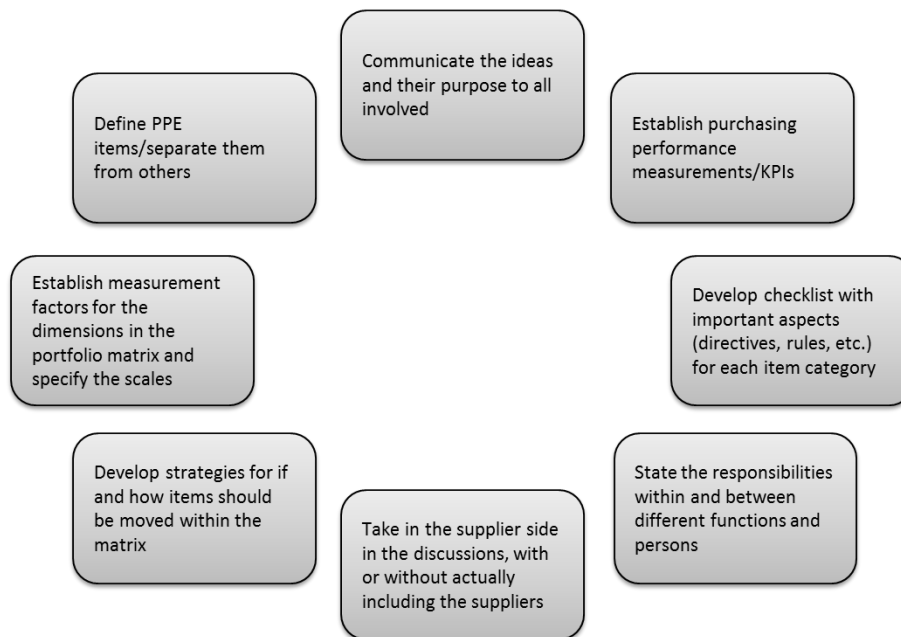


Figure 36. Suggestions on further actions for Höganäs

9.5.2. Suggestions for academia

More empirical investigations

The topic of business process standardization and its impact on companies' performance is a well-examined one. The connection between purchasing process standardization and efficiency (and effectiveness) is however lacking behind and could use further investigations. Theoretically, of course, but it would be interesting both for academia and for purchasing managers to see a satisfying amount of actual results from standardization of purchasing processes.

This would presumably also give more hands-on suggestions both for how to realize the strategies and how to take those strategic models closer to the operational levels of the companies.

Decision frameworks for portfolio placements

The author believes that it could be possible to develop more specific decision frameworks for the dimensions within purchasing processes. By this is meant that one could be more explicit on which factors that could be the decision factors that determine where in the portfolio model an item should be placed. For example, in the dimension *supply risk* one could be more explicit on what factors this can be divided into, e.g. number of available suppliers and suppliers' ability to deliver within a certain timeframe. Such decision frameworks could for instance be adapted to different industries.

Positioning and movements within purchasing portfolio models

It is believed that many of the choices when positioning items into certain categories are subjective. What can this imply? What are the risks connected to this subjectivity? What happens if an item gets into the wrong group according to its characteristics and is treated strategically or operationally wrong? Those questions could use a further investigation.

The research on strategies for how to move items within a portfolio model is connected to this and would also be interesting to see an extension of.

The trade-off between efficiency and quality

Beimborn et al (2009), one of the references within *4. Theoretical framework*, investigated the balances and trade-offs between efficiency, quality, control and time from process standardization. All of these aspects would be interesting to see further research on, but as the improvement suggestions in this research has been based on efficiency, the question has arisen on how the described measures for improved efficiency affect the quality, control (as in preventing innovation) and processing time.

The environmental perspective

Any environmental issues connected to either purchasing or purchasing processes have not been touched upon in this research. Within the literature study this aspect was not very apparent either. If any, it is usually discussed as a separate part within books or articles, but never as an integrated issue within all parts. In accordance with how important the environmental questions are and have become today in many other research areas this is remarkable and it is seen as an important area of future (or current?) research by the author.

9. Conclusions

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Appendix A – Data collection protocol for unstructured interviews and conversations

Purchasing processes

- Purchasing process steps
 - Steps and activities that exist in the process
 - The role of the technical department and the role of the purchasing department within the different steps (and other departments as well)
- Types of purchases and perceived buying situations
 - Different considerations according to what type a specific item to be purchased is considered to be
- Going through the purchasing process, hands-on/examples
 - Specifications
 - Supplier selections
 - Contracting and negotiation
 - Goods reception
 - Follow-up on suppliers
- Procedure in internal information system
- Examples of purchase specifications, requisitions, contract, order, supplier ranking and evaluation
- Regarding how to know what documents and important aspects to consider
 - Existing procedures and guidelines
 - Know-how and experience
 - If not documented, how to know about it
- Quality documents
 - Internal, external
 - Non-official, official
- Function descriptions (may reveal what *should* be considered)

Items, item groups, stock-kept items

- Types of items considered production process equipment
 - Characteristics
 - Relation to textbook definitions on direct and indirect material
- Existing divisions of production process equipment
 - The naming of items
- Which items are stock-held and not

Efficiency effects

- What do the company representatives think about efficiency potentials
 - Steps in the process?
 - Standardization?
- What can be done faster with a standardized process?

Standardizing purchasing processes

- And slower?
- Is it possible to point out where most mistakes are done today?
 - Can they be avoided by means of the standardization?
- Where is it most important that things are done correctly?

Appendix B – Follow-up data collection protocol for semi-structured interviews

Purchasing processes

- A need arises
 - How does one find out if an item can be found at the warehouse?
 - Whose responsibility is it to ensure that items are stock held? (If a “simple” item that is searched for is not stock held, is it the one with the need that should trigger the purchasing process or should the needs-holder only contact e.g. the purchasing department?)
- Search the external market
 - How does one know which suppliers exist? Who keeps track of this?
- Choices of suppliers and A6 Negotiations
 - Is negotiation preparation always performed jointly by purchasing department and the buyer or project manager?
- Purchase order
 - Is it entirely true that a purchase totally disappear from the ERP-system when the requisition is handled by the purchasing department?
- Order confirmation
 - Is it correct that the order confirmation is the first legally binding document, not the order in itself?
- Delivery and Goods reception
 - Description on how it is done
- Internal delivery
 - What problems may arise if the purchasing department does not get to know that a internal delivery has taken place? (E.g. when the item is as small it fits in an envelope and is sent straight to the buyer.)
- Post-purchase activities
 - Is there any follow-up with suppliers after a completed purchase?
 - Are suppliers evaluated in any way at all?

Items, item groups, stock-kept items

- How well-established are the three divisions of purchases (i.e. function, type and situation)?
 - Are articles, specific parts, maintenance part, and special machines generally accepted naming and division?
- The warehouse
 - How/in what ways is the warehouse connected to the purchasing process?
 - In terms of delivery, goods receiving, internal delivery and post-purchase activities
 - Is there any reconnection to the suppliers regarding the stock-held products?
 - What items are stock-kept and not?
 - How is it decided?
 - How is the introduction of new items in the warehouse handled?

- Which department is responsible for keeping the right items in stock?
 - I.e. the warehouse, the purchasing department, any department with the technical knowledge?
- Is the purchasing of a cheaper item handled in the same way as a more expensive item?
- How is warehouse purchases used by the technical department?
- How and where is the coordination between the warehouse and the purchasing department, if any?
- Groups of items
 - To what extent have items been grouped into different categories?
 - When is the categorizations used?
 - And by who?
 - Specific examples of products/items in each group

Practical and technical aspects

- Could it be possible to integrate the coming recommendation into the ERP-system?
 - What are the requirements for this?
- Is there a possibility to incorporating the suggested processes, or parts of it, into the internal process map tree?
 - What requirements does this put on the recommendation?
- Are there any required investments?
 - Apart from IT-related, things like employee education?

Appendix C – Case company respondents

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