CHALMERS

Customer involvement in organizations' interchangeability

Master of Science Thesis
in the Management and Economics of Innovation Programme

SARA HARTWIG
MAGNUS LANTZ

Department of Technology Management and Economics
Division of Innovation Engineering and Management
CHALMERS UNIVERSITY OF TECHNOLOGY
Göteborg, Sweden, 2013
Report No. E2013:105

MASTER'S THESIS E2013:105

Customer involvement in organizations' interchangeability

SARA HARTWIG
MAGNUS LANTZ

Tutor, Chalmers: Sara Fallahi
Tutor, Stora Enso: David Simonsson
Examinator, Chalmers: Jonas Hjerpe

Department of Technology Management and Economics
Division of Innovation Engineering and Management
CHALMERS UNIVERSITY OF TECHNOLOGY
Göteborg, Sweden 2013

Customer involvement in organizations' interchangeability

Sara Hartwig
Magnus Lantz

Master's Thesis E2013:105

Department of Technology Management and Economics
Division of Innovation Engineering and Management
Chalmers University of Technology
SE-412 96 Göteborg, Sweden
Telephone: + 46 (0)31-772 1000

Chalmers Reproservice
Göteborg, Sweden 2013

Abstract

Having high interchangeability in an organization's production processes is becoming more and more important today. Interchangeability means being flexible and being able to move production between machines and production sites depending on where there is available capacity. Recent studies also show that companies put a lot of efforts into developing and maintaining close relationships with their customers, involving them more and more in the company's processes. However, there is not much written about the relationship between close customer relationship and interchangeability. Consequently, here is where this thesis aims to contribute. The purpose is therefore to find out how customer involvement affects interchangeability in well-established organizations and to investigate how organizations motivate their customers to take part in the work with increasing interchangeability.

In order to reach the purpose a case study has been conducted at the forestry company Stora Enso and their unit called Renewable Packaging. Information has been gathered through multiple interviews employees. A literature study was also carried out to be able to link findings and concepts together in the analysis.

Results show that if a product has been developed decentralized at one production site to be produced only there, then it is difficult to achieve interchangeability for that product in retrospect. Instead, it is important to have a focus on interchangeability from the very beginning, meaning that during the new product development phase assure customers and the company that this product can be produced on more than one production site. Results also show that customers are not prepared to take part in the work for increasing interchangeability just for the sake of doing it. They must see some gain of their own or the will not take part. To conclude it can be seen that customer involvement *can* have a negative effect on interchangeability dependent on the type of product; existing product or new product.

Keywords: *Interchangeability, Customer Involvement, Swi¨tching Barriers, Machine Flexibility, B2B Relationships, New Product Development, Motivational Factors*

Acknowledgements

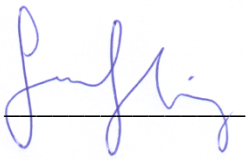
First of all we would like to thank our two supervisors, Sara Fallahi at Chalmers University of Technology and David Simonsson at Stora Enso. Your help and guidance has been extremely important and useful for us throughout the entire time working with this thesis.

We would also like to send our thanks to Ann Moberg at Stora Enso who arranged for us to go and visit Skoghall production site and who provided us with a lot of valuable information throughout the work.

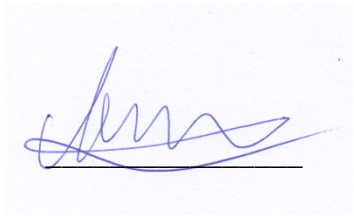
Thank you also to our examiner Jonas Hjerpe, at Chalmers University of Technology, for giving us valuable feedback and comments.

Lastly we would like to thank everyone at Stora Enso for devoting your valuable time to answering our questions and providing us with the information needed to complete this thesis. A special thanks also to Marcus Dehlin at Stora Enso for giving us feedback and comments on our work.

Gothenburg, August 2013



Sara Hartwig



Magnus Lantz

Table of Contents

1 Introduction

This chapter starts with a presentation of the background for the study, motivating why the study is relevant by revealing a research gap existing in the published literature today. The background is followed by the purpose, research questions, scope and delimitations. The chapter also includes a short motivation of why this study is of interest as well as a description of the intended target group of the study. In the end a summary of how the study was conducted is presented along with a description of the structure of the report.

1.1 Background

For companies today it is of great importance to have flexibility in the manufacturing processes in order to adapt to changing market demands (Wahab et al., 2008; Zammori et al., 2011). This also means that there is a need for having a high degree of interchangeability for the machines and processes within the company. Interchangeability means a situation where two or more items are able to be exchanged with each other. The literature in the field of machine interchangeability is not extensive. However, in their article, Henrich et al. (2007) present three reasons for why machines today are commonly not fully interchangeable, namely that, machines are bought at different times and differ due to technological development; the product range has increased, forcing the company to invest in alternative machines or; a growth in product volume has made the company require different or faster machines. However, it is not mentioned in the literature in what ways the customers are able to influence the development of a manufacturing company's machine and process interchangeability.

In contrast to the small amount of literature written in the field of interchangeability, there is a lot written within the area of Customer Relationship Management (CRM) and customer involvement. It is stated that the development within business-to-business (B2B) relationships has gone towards maintaining and developing existing customer relationships rather than creating new (Ulaga, 2003; Kalwani & Narayandas, 1995). Furthermore, suppliers should try to tie their customers to them by creating strong switching barriers (Vizard, 2004) or lock-in effects (Buschken, 2004). But what are the possible consequences of having close customer relationships and a lot of customer involvement in a company's processes? Especially when it comes to flexibility and interchangeability there are certain aspects of customer involvement worth shedding light on. For example, could customer switching barriers play a large role when increasing interchangeability?

Today, there is not much written, if anything, about the link between customer involvement and the ability for a B2B organization to achieve higher interchangeability. Here is where a gap has been identified and consequently it is within that area this master thesis aims to contribute. The objective will be to look into customer involvement concerning

interchangeability and flexibility between different machines in well-established organizations. Furthermore, the objective will also be to look into customer switching barriers, mainly in the form of monetary investments, and investigate how these affect a company's ability to increase their interchangeability. This is because if Stora Enso changes their production and products, then their customers need to change their production and hence the investment cost. Finally, the thesis will deal with how to motivate the customers to take part in the work for increasing interchangeability.

1.2 Purpose and Research Question

The purpose of this study will be to investigate in what way customer involvement affects interchangeability in well-established organizations. Increasing interchangeability for an organization means producing a product in a different machine, which inevitably means the customers have to qualify a "new" product in their processes. This implies a cost for the customers that they might not be willing to take and therefore the purpose will also be to look into how the customers can be motivated to increase interchangeability.

To reach this purpose a case study was conducted at Stora Enso Renewable Packaging looking at three different production sites, investigating how the customers affect the interchangeability internally within and externally between these sites and trying to identify what is required in order to increase the overall interchangeability. The case study and a company description is presented in Chapter 4.

In order to reach the objective of this study the purpose has been broken up into two research questions below. Answers to the questions are given in the final concluding chapter of the thesis.

1. *How does customer involvement affect interchangeability in well-established organizations?*
    - *What are the implications of switching barriers when increasing interchangeability?*
2. *How do well-established organizations motivate their customers to take part in the work with increasing interchangeability?*

1.3 Scope and Delimitations

The scope of this thesis will be to look deeper into how customer involvement affects interchangeability in well-established organizations. Emphasis will be on switching barriers in order to see in what ways customers can affect a company's ability to increase its interchangeability.

The study is limited in the way that the research questions will be answered by only investigating one single case and therefore the conclusions will not be generally applicable. The case study included in the thesis will only concern one part of Stora Enso's organization, i.e. Stora Enso Renewable Packaging. The thesis will not look into the interchangeability within any other part of the company or between any other production sites than those three specified further on in the report.

The thesis only concerns B2B relationships. This means that when discussing customer relationships, B2B relationships are always referred to unless something else is explicitly stated.

Another delimitation in the case study is the fact that the study does not involve any direct interaction or communication with customers. All information gathered comes from the company, Stora Enso, and it is solely their information, views and opinions that are presented in the results of this thesis.

1.4 Target Group

The target groups for this thesis will be researchers in the area of customer relationship management, customer involvement and production development. Another target group will also be organizations facing problems related to customer involvement and interchangeability. The thesis will be written with a knowledge base equivalent to that of a master student at Industrial Engineering and Management so that students will be able to use the thesis as reference material during master studies.

1.5 Motivation for the Study

The topic of this master thesis is interesting because it addresses common issues in well-established organizations. When an organization grows large the flexibility in for example its production, organizational structure and product development decreases. This decreased flexibility and meeting the external changes can lead to a loss of competitive advantage, increased costs and lower margins, that ultimately can lead to bankruptcy. This topic is also an area of interest because today there is a trend towards increased customer involvement in daily operations, R&D, supply chain operations etc. The intent is therefore to investigate the consequences of customer involvement, thus, this case will highlight the effects of too much involvement and the challenges related to interchangeability and business development.

1.6 Research Method in Brief

The research will be conducted on a single case study where interchangeability at Stora Enso Renewable Packaging and more specifically within the Consumer Board segment will be explored. An analysis of the findings from the case study together with an analysis of existing literature within the research area will lie as a foundation when answering the above research

questions. The general approach to perform this study ended up in abductive reasoning. The analysis will answer the research questions, whereas the conclusions can provide a foundation to further research and in the extension to generalizations about customer involvement and interchangeability.

In this thesis different kinds of interviews with people that have some connection to CRM and interchangeability at Stora Enso will be the largest part of the data collection. The data will be collected in a qualitative manner which excludes quantitative data analysis, such as regression analysis. This was done to suit the general abductive approach where intent was to describe a setting and lay foundations for further research regarding customer involvement in well-established organizations. The analysis and conclusions will consequently be qualitative. However, it is important to understand that this thesis will not provide or create any new theory since its outline; a single case study. If a theory should be built from this study the theory would only fit into this situation and by definition fails to qualify as a general model or theory. But instead, as mentioned above, the conclusions drawn will act as input to new further research preferably a comparative study with similar settings as described in Chapter 7.

1.7 Structure of the Report

The thesis is divided into seven chapters and in order to create a flow and understanding of what to expect while reading, a short explanation of each chapter is presented below.

Chapter 1 - Introduction

This chapter introduces the reader to the field of research and gives a personal motivation for conducting the study and explains to whom this report is relevant. Furthermore, the purpose along with the two research questions to be answered is presented. The chapter also presents the research method in brief to create an understanding of how the questions are going to be answered.

Chapter 2 - Theory

The theory chapter develops the theoretical areas briefly mentioned in the background, it also presents other research relevant to the purpose of this study. The section is divided into two parts, namely, internal and external factors that affects interchangeability and the relevant areas are *Interchangeability, Capacity Utilization*, *Organizational structure and strategy, Customer relationship management, Business to Business Relationships, Switching Barriers, Commodity versus Customized Products* and *Risk Management in Supply Chain.* As a concluding part this chapter has a description of how the literature is going to be used to analyze the findings.

Chapter 3 - Method

This chapter contains a detailed description of how the study was conducted. It also describes why the chosen research design was considered suitable for the study. Finally, it explains what type of analysis was used.

Chapter 4 - The Case Study at Stora Enso

This chapter constitutes the main part of the thesis and an in-depth description of Stora Enso Renewable Packaging, Consumer Board and the current situation. It will cover all relevant information that has been brought up throughout the interviews with people at Stora Enso. This section is based on three types of interviews as well as internal documents provided by Stora Enso, essentially it is all the empirical data gathered during the study.

Chapter 5 - Analysis and Discussion

This chapter discusses the empirical findings in relation to the theory. It provides an analysis of why Stora Enso's organization looks the way it does today and why customers are so involved in the work with increasing interchangeability. Furthermore, the chapter provides a discussion about what can motivate customers to take part in the work for increased interchangeability based on both the presented theory and the empirical findings.

Chapter 6 - Conclusions

The concluding chapter summarizes the analysis and clearly states the answers to the research questions. It also states the implications of the findings related to the research questions.

Chapter 7 - Recommendations

This last chapter provides some guidelines for further research to continue to fill the identified gap mentioned in the introduction. It also gives some recommendations regarding motivational factors to include customers in the work of increasing interchangeability for Stora Enso.

2 Theory

The theory chapter covers the relevant literature related to the research questions. To understand the logic of the following passage, it is divided into (1) internal factors which are factors within the company, its operations and structure, (2) external factors, which are customers and other factors outside the company affecting the interchangeability, and (3) a final section about handling risk. The chapter ends with a concluding section of how the theory sections are connected, issues that are inherent within them and lastly how the theories are intended to be used in the analysis of the case study.

The internal factors section covers definitions and understandings of the main concept interchangeability as well as gives an introduction to the concept of capacity utilization. It also covers literature concerning organizational structure and strategy. The second part of the chapter covers external factors that affect interchangeability, mostly, how companies handle customer relations, supplier relations and what the market for companies similar to Stora Enso looks like. The final section deals with risk management with focus on supply chain risks.

2.1 Internal Factors

This chapter is important since it gives the reader a base for understanding what interchangeability is and why increasing it is beneficial, however the chapter on external factors is the one upon which most parts of the analysis will be based.

2.1.1 Interchangeability

According to Cambridge Dictionaries Online two items are interchangeable when they are "able to be exchanged with each other without making any difference or without being noticed"[1]. BusinessDictionary.com provides a similar definition of interchangeability saying that it is a "situation where two or more items are so similar in functional and physical characteristics that they are considered equivalent in performance and durability. Each is capable of replacing the other(s) without causing a need for alteration or adjustment to fulfill the same requirement"[2]. The definitions agree on that for an item to be interchangeable with another no alterations or changes should have to be made to any of the items, this view is also supported by Watts (2009) who presents a quite thorough definition of what interchangeability is, by saying that: "Two or more items are considered interchangeable if, in all applications, they are:

[1] Cambridge Dictionaries Online. Interchangeable. Retrieved April 16, 2013, from http://dictionary.cambridge.org
[2] BusinessDictionary.com. Interchangeability. Retrieved April 16, 2013, from http://www.businessdictionary.com

1. Of an acceptable form (appearance) to meet all esthetic requirements per the Product Specification.

2. Of a proper fit (physical) to assemble with other mating items per the drawing dimensions and tolerances.

3. Of a proper function to meet the product specifications including performance, safety and reliability requirements.

4. These criteria must be met both ways (old design in the new and vice versa) with no special adjustments, modifications, or alterations, to the item or related items. (Your definition might be different regarding adjustments, etc.)" (Watts, 2009, p. 74)

It is also stated that items which meet some but not all of the above mentioned criteria are not completely interchangeable and therefore said to be "noninterchangeable" (Watts, 2009, p. 74). However, Henrich et al. (2007) talk about the term semi-interchangeability which relates to the technical ability of production machines to perform similar but not identical operations. It is explained that even if two machines have similar characteristics and perform the same kind of operations they may not be able to handle or produce the same kind of products but the products may overlap to a certain extent. Furthermore, Henrich et al. (2007) explains three typical reasons for why machines are semi-interchangeable and not fully interchangeable:

(a) Machines bought at different times are different due to technological development;

(b) The range of products are increased and technological characteristics make alternative machines a requirement;

(c) Different or faster machines are required due to a growth in product volume

The authors also define two semi-interchangeability situations that can be found in practice. The first one is *specialization*, meaning that two machines are each specialized to produce certain orders while some orders can be produced on both machines. The second one is *dominance*, meaning that one of the machines is not specialized to produce certain orders but only produces orders that are interchangeable.

A concept related to interchangeability is manufacturing flexibility. Having flexibility in the manufacturing processes means having the ability to adapt to dynamic market demands and conditions (Wahab et al., 2008) and this is something that has gained great importance as a strategic weapon against rapidly changing markets today (Tsourveloudis & Phillis, 1998). It is also stated by Zammori et al. (2011) that manufacturing flexibility has become one of the main levers in order to succeed in today's ever-changing markets.

There exists a large amount of definitions of manufacturing flexibility but perhaps one of the most basic definitions says that it is the ability of a system to cope with changes (Gupta & Buzacott, 1989). Choi and Kim (1998) have a similar definition saying that manufacturing flexibility is the adaptability to environmental changes in manufacturing. Logically, manufacturing flexibility is strongly associated with uncertainty in many levels of a company's operations, uncertainties such as variation in demand, variation in product characteristics or unexpected interruptions of the production process because of machine breakdowns (Tsourveloudis & Phillis, 1998).

Wahab et al. (2008) similarly mention the uncertainty related to variations in demand and state that this uncertainty is a major variable upon which machine flexibility depends on. Machine flexibility refers to the ease of making the changes required to produce a given set of part types (Browne et al., 1984). Furthermore, Wahab et al. (2008) state that out of the different types of manufacturing flexibility that exists, such as machine flexibility, product mix flexibility, process flexibility, operation flexibility and routing flexibility, the machine flexibility is the most important and fundamental one which many of the other flexibilities depend on.

2.1.2 Capacity Utilization

In the literature the most commonly used definition of capacity utilization seems to be that it is the ratio of the actual level of output to an estimated maximum level of output of the plant or production site (Calhoun, 2002; Coelli et al., 2002; Corrado & Mattey; 1997). The maximum level should be defined as an achievable output which can be reached under normal conditions, allowing for usual vacations and normal maintenance (Klein & Long, 1973).

Berndt & Morrison (1981) have suggested a somewhat different approach to measuring capacity utilization. The approach, which can be referred to as a more economic way of measuring capacity utilization, takes a wider perspective on the concept and includes the effects of varying costs, such as for example changing energy prices, on the capacity utilization measure. This means measuring the capacity utilization as the ratio of actual output to the level of output beyond which the average cost of production begins to rise and it is no longer desirable to increase the capacity. This economic view of measuring capacity utilization is also supported by Youn Kim (1999) who states that the traditional measures of capacity utilization are more an engineering than an economic concept.

Coelli et al. (2002) writes about the relation between profitability and capacity utilization and after reviewing the existing capacity measures they conclude that none of the measures provide meaningful information when used in a profit decomposition analysis. They then suggest a new ray economic utilization measure in order to decompose the identified gap between observed profit and maximum profit into components due to unused capacity,

technical inefficiency etc. In an empirical study of 28 companies it is then concluded that around 70 % of the gap between maximum and actual profit can be linked to unused capacity (Coelli et al., 2002).

2.1.3 Organizational Structure and Strategy

The increasing global competition has highlighted the importance of the decision concerning where to locate a multinational company's activities (Colovic & Mayrhofer, 2011). An organization can be structured in two ways, having either centralized or decentralized activities. While centralized can be described as allocating resources, activities and responsibilities together, decentralized deals with distributing the activities, resources and responsibilities worldwide to local subsidiaries (Alphonso et al., 1992).

There has been extensive research on where to locate a company's R&D activities in order to maximize output (Alphonso et al., 1992; Argyres & Silverman, 2004; Colovic & Mayrhofer, 2011). The main focus has been on how to obtain knowledge from different markets, and one way of doing so is to place R&D activities in close proximity to the intended market. Therefore, companies sources know-how about customer needs and technological development (Sanna-Randaccio & Veulgelers, 2007; Argyres & Silverman, 2004). In their research Sanna-Randaccio and Veulgelers (2007) develop a model of the potential trade-off between allocating R&D activities and resources centrally and distributing in close proximity to the market. Thus, the main objective is to gain know-how about customers and maximize utilization of the innovation process. However, there are also some issues with a decentralized R&D organization, more specifically, two main areas from Sanna-Randaccio and Veulgelers (2007) point of view:

1. Transferability of knowledge: is important to transfer the external know-how from one site to another to gain higher profitability for the organization. In an organization that is separated and has a high degree of decentralization this is hard.

2. Leakage of knowledge: At the same time as a company is gaining know-how from the existing market there is a possibility that this know-how will become spillover that competitors can utilize and thus become more competitive.

One step further in the evolution of the company structure and organization is to bundle production and R&D activities together. This can be done to the extent that it might be impossible to unbundle these functions in a company (Ketokivi & Ali-Yrkkö, 2009). In their research Ketokivi and Ali-Yrkkö (2009) find that the coalition of R&D activities and manufacturing is a rule rather than an exception, and that in fact a manufacturing site is a complex technology center for both creation and application of knowledge. Dorothy (1992) defines core capability on four dimensions, (a) knowledge and skill, (b) technical system, (c)

managerial skills and (d) values and norms. Dorothy (1992) further evaluates that these dimensions cannot be achieved instantaneously, instead it is an ongoing process of internalizing tacit knowledge. This is strengthened by the research done by Ketokivi and Ali-Yrkkö (2009) where they suspect that there is a need for jointly developing products and processes in order to maximize utilization of the know-how.

Dorothy (1992) proposes core rigidities as an issue with decentralized R&D capabilities where he insinuates that too diverse capabilities hamper cross functional development projects and the knowledge sharing within a company. These findings are in line with what is stated by Sanna-Randaccio and Veulgelers's (2007), where they conclude that better internal know-how sharing within an organization would lead to a better way of obtaining new knowledge and vice versa.

2.2 External Factors

In the second part of the literature chapter the focus will switch from looking internally to looking at the company environment with major focus on the customers. The nature of business-to-business relationships and the implication of switching barriers will be described and finally there will be a short section about developing two different types of products: commodity products and customized products.

2.2.1 Customer Relationship Management

Defining Customer Relationship Management (CRM) is not an easy task. For some companies CRM refers to sending direct e-mails to customers, for some it means customizing products to specific customer needs and for others, CRM is about using complicated IT tools for analytical processing and for establishing customer interaction centers (Winer, 2001). As a result, there have been many attempts to clarify the concept of CRM and the processes it consists of (see Payne & Frow, 2005; Reinartz, 2004; Winer, 2001). Payne and Frow (2005) define CRM as a strategic approach for managing customer relationships to create shareholder value, and they further explain that CRM is about identifying all strategic processes that take place between a company and its customers. The strategic view of CRM is also shared by Chen and Popovich (2003) who claims that CRM is an integrated approach to managing customer relationships by focusing on customer retention and relationship development. Furthermore, according to Chen and Popovich (2003) a successful implementation of CRM will lead to customer loyalty and long run profitability.

A concept related to CRM was introduced by Askelöf and Arndt (2009). The concept, called Customer Involvement Management (CIM), is presented as the next step in the development of CRM and focuses even more on the involvement of customers in a company's processes. The authors claim that the CIM development will accelerate as companies begin to identify

new areas where customers can be involved, such as product design, marketing, sales and customer services.

Returning to the concept of CRM, Reinartz (2004) has investigated CRM processes in three stages of the customer relationship, namely the relationship initiation, maintenance and termination. This investigation was done in order to see where the processes lead to better company performance. The results indicated that CRM processes are associated with better company performance especially in the maintenance stage and also to some extent in the initiation stage. In the termination stage the effects were not significant. The results support what Winer (2001) writes in his article about CRM and recent development. He states that the development within CRM has gone from a focus on customer acquisition to customer retention since studies have shown that repeat customers generate more than twice as much income as new customers. This development is also present when looking at supplier-buyer relationships, which will be further described in the following section.

2.2.2 Business-to-Business Relationships

Recently, there has been shift in business to business (B2B) relationships when discussing supplier-buyer relationships. The movement has gone from using many suppliers towards developing and maintaining in-depth relationship with fewer suppliers (Ulaga, 2003; Kalwani & Narayandas, 1995). Kalwani and Narayandas (1995) further explain that the reason for this shift is because manufacturing companies want to increase their competitive advantage with the purpose of securing valuable resources. The ultimate state is to vertically integrate and become your own supplier. However, the tendency is to develop long-term relationships between supplier and manufacturer with mutual benefits. Ulaga (2003) further argues that a manufacturer needs to either invest in key relationship, keep existing ones or leave suppliers that are not valuable for the company. This decision together with increased competitive advantage is the reason for the emergence of closer long-term relationships between supplier and manufacturer (Kalwani & Narayandas, 1995).

Several articles about the values that long-term relationships can bring have been published (Ulaga, 2003; Kalwani & Narayandas, 1995; Klioutch & Leker, 2011). After qualitative interviews with purchase managers Ulaga (2003) proposes eight different drivers of value with supplier-customer relationships in B2B sales; (1) *Quality*, dealing with both product quality and delivery consistency; (2) *Service support,* which deals with the two aspects product related services and information activities; (3) *Delivery performance,* meaning flexibility, accuracy and on time delivery; (4) *Supplier Know-How,* involvement in product development and great understanding of the end product making a supplier strategically important; (5) *Time-to-market,* the shift from labor cost to flexible manufacturing have increased the importance of production and product development speed; (6) *Personal*

interaction, important to acknowledge that it is the people within companies that do business; (7) *Price;* and (8) *Process cost,* it is valuable to keep costs associated with production low.

These drivers are similar to what Klioutch and Leker (2011) find in their study about supplier involvement in new product development. Furthermore, they introduce two concepts that categorize these drivers, *direct* and *indirect functions,* where the direct functions involve drivers that have purely economic focus and indirect functions are soft values that can be beneficial over time. They conclude that direct functions have strong influence on firms that usually do not innovate and indirect functions have strong influences in relationship with firms that have a higher degree of innovativeness. A similar finding is presented by Kalwani and Narayandas (1995) where they argue that all suppliers serve economic benefits in long term relationships with manufacturers, mainly by streamlining their productions. They further argue that a long term relationship strategy brings many positive effects compared to a transactional view (switching between customers), e.g. a supplier will lose competitive advantage if not engaging in a long term relationship with a manufacturer. The reasoning from Kalwani and Narayandas (1995) point of view is; if you as a supplier do not develop this relationship a competitor will.

2.2.3 Switching Barriers

Switching barriers have been defined as any factor that makes it more difficult or costly for customers to change providers (Jones et al., 2000; Blut et al., 2007). More specifically, the barriers could be for example interpersonal relationships, perceived switching costs and the attractiveness of competing alternatives (Jones et al., 2000). The perceived switching costs are the costs that a buyer associates with the termination of a current supplier relationship and the costs of establishing a new relationship with another supplier (Yen et al., 2011). The costs or barriers are comprised of different costs such as search costs, transaction costs, learning costs, loyal customer discounts, customer habit, emotional cost and cognitive effort (Fornell, 1992).

Vizard (2004) talks about switching costs and loyalty and explains that loyalty is very much related to inertia; the supplier should find ways to institutionalize that inertia by continuously making it easier for the customer to order through them rather than through another supplier (Vizard, 2004). Also Blut et al. (2007) discuss loyalty in relation to switching costs saying that customers are loyal to a provider because of the difficulties of changing to another provider. Buschken (2004) takes it even further saying that companies should attempt to set up switching costs as barriers to make customers economic hostages. He sees the barriers as a strategy for creating so called lock-in effects making it economically impossible for a customer to switch to another supplier.

Switching costs are also used in order to increase a company's bargaining power in the supply chain (Crook & Combs, 2007). Weak members of a supply chain can gain from building

switching costs with stronger members and thus increase survival chances (Crook & Combs, 2007).

2.2.4 Customized Products versus Commodity Products

The increased competition have put pressure on organizations to customize and adapt products, marketing etc. to customer's special needs (Bernhardt et al., 2007). It is further explained by Bernhardt et al. (2007) that the extreme of customization where a company's customers create the products themselves. Another way of beating competition is provided by Porter (1980) where he proposes three generic strategies to be competitive, *Cost leadership, Differentiation* and *Focus.* The one strategy of main interest for this master thesis is overall cost leadership. Porter (1980) explains it as stripping down the product and overhead costs (e.g. marketing, R&D, service, sales etc.) to increase the difference between income and costs. The extreme position is to produce products seen as commodity products. The difference between these two strategic choices regarding products is explained by Du, Jiao and Tseng (2003). They state that a commodity strategy provides a "take it" or "leave it" option to customers, meanwhile a company that chooses a customization approach can deliver unique products that are adapted to a specific customer needs.

In interest of this study it is important to evaluate three different product development approaches presented by Kaulio (1998), the approaches are *Design for, Design with* and *Design by.* He views 'customer involvement' as the interaction of a customer and a company's design process, which can be seen as a form of customization. The three methods have different degree of customization, and they are explained below:

- Design for: Products that are designed for customers based on customer studies, behaviour, preferences, usage etc.

- Design with: Uses the same data as design for but with one addition where the customer is included in concept testing and evaluation of new product ideas.

- Design by: Involves the customer in the development process leading to that the customers almost entirely design the products themselves.

2.3 Risk Management in Supply Chains

Risk management and contingency planning within economics, strategic planning and international management has been relevant topics for researchers and companies for a long time (Jüttner et al., 2003). The authors further acknowledge the importance of calculating and foreseeing events that can have a disruptive effect on a company's supply chain and ultimately lead to stop in production and loss of sales. This is also confirmed by Matook et al. (2009), they argue that managing risks through the supply chain is component for value add and securing profitability.

For the purpose of not creating any misunderstanding of the concept of risk management, it must be properly defined in relation to supply chain risk. Matook et al. (2009) write about risk management as the management of all events that occur that cause the flow of material, information and capital to be disrupted. Jüttner et al. (2003) define supply chain risks in a similar way, saying that it is risks that are included within the flow of information, material and product from producer of a component to the final products is complete and at its end user. Henceforth, risk management will mean any disruptive event that can hamper the flow of information, material, products and capital in a supply chain.

The risks sources can be divided into three main areas: Environmental risk sources, network-related risk sources and organizational risk sources (Jüttner et al., 2003).

(i) Environmental risk sources are disruptive events that have its origin in the surrounding environment that affect the supply chain e.g. fire, political actions or natural disasters.

(ii) Network-related sources are arises from interaction between different parts of the supply chain (companies).

(iii) Organizational sources lie within the supply chain parties and include strikes, production uncertainties and IT-system uncertainties.

This categorization of risk sources can be regarded as sources 'to' (organizational and environmental) and 'of '(network-related) the supply chain (Jüttner et al., 2003).

One way of handling risk on a managerial perspective is using the Swiss cheese model seen in Figure 1 (Shahriari, 2011). Shahriari (2011) describes the idea as a representation of how an accident can occur even though safeguards and safety measures are in place. Where every slice of safeguards have some inherent fault (e.g. human error) and with multiple safeguards reduce the possibility of accident can occur.

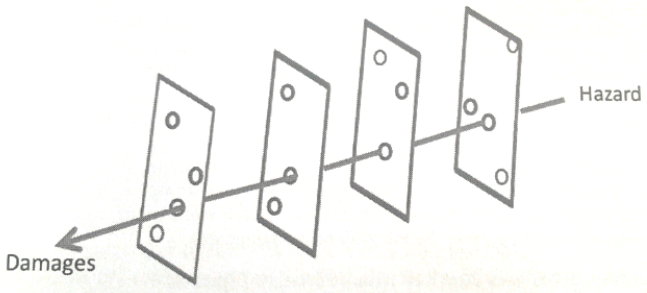


Figure 1: Swiss cheese model – a mindset when handling hazards and safety measures (Shahriari, 2011).

2.4 Use of the Theory

For the reader it might be somewhat difficult to understand how the different literature parts and concepts are relevant and linked to each other and to the research questions. This is mainly due to the fact that there has been limited research conducted about the relationship between the theory of interchangeability and customer involvement in a company's processes. The intent of the literature study is mainly to explain the concepts and summarize the results of previous research that may affect production and machine interchangeability and flexibility. However, some parts might not be as important as others in relation to the research questions instead they will act as a base for understanding the other concepts. The theory will be used as a framework explaining different angles that affect production and machine interchangeability and flexibility on two different dimensions, internal and external. The idea of dividing this chapter into two main parts (internal and external factors) is useful because both parts serve a purpose in determining the level of interchangeability that is achievable and what are the inhibitors and the enablers. It is also useful because it is of great interest to realize what can be done by the company alone and what must be done together with the customers.

The starting point in the study is capacity utilization and in what way it can be maximized with an increased degree of interchangeability or production flexibility. Therefore, it motivates the importance of analyzing a company's internal environment such as the organizational structure, climate etc., however, it will not be the main focus. Instead it will be used with a more exploratory approach to determine what the existing environment looks like. External factors, with focus on customer involvement, are essential to this thesis and therefore constitute the main part of the theory. It is important to gain knowledge about existing research and theory of how companies manage their customer relations and what consequences different degrees of closeness (how much influence customers have on daily operations) brings. Concepts that will be used are first and foremost customer involvement, switching barriers, lock-in effects and supply chain integrations (business to business relationships).

Risk management has its own separate section in the theory because it does not only contribute to the answer of the research questions, but it also acts as a motivator for change and will mostly be dealt with when applying the theory at the case study of Stora Enso. The intent is that by explaining the working environment and in what ways the company works with their customers it will be possible to analyze the interchangeability and its inhibitors and enablers, and by doing so answer the research questions.

To conclude, all these theories have been chosen to either help the reader or researcher to understand the concept or as an input to answering the research questions. The sections concerning interchangeability and customer relationship management includes all the basics

needed to understand what the study is about. The capacity utilization concept is the very foundation to why the research on increasing interchangeability was initiated. To understand the context in which these concepts are studied it is important to know B2B relationships and how the organizational structure affects the work with increasing interchangeability. Therefore these two sections provide an understanding of how the concepts of interchangeability and customer relationships interact in the studied company. The sections about switching barriers and customized versus commoditized products were included further on in the literature study because they were raised as important concepts to think about when working with increasing interchangeability. And so the role of those sections is mainly to provide a wider angle to the analysis.

3 Method

In this chapter it is described how the research was conducted; which research strategy and design that was used as well as how and what kind of data was collected. As an ending to this chapter a discussion about the quality of the research is held.

3.1 Research Strategy and Design

The stipulated research questions can be answered by choosing many types of research designs, proceedings and with different intentions. However, when the purpose is to fill a gap in existing literature, as in this thesis, it is not suitable to use a quantitative approach because the variables to be studied are unknown to the authors and in existing research. Thus, a qualitative approach was used with the data tailored to fit a qualitative method of analyzing the data, grounded theory. Furthermore, if the intent is to begin to explore the field of study and the identified gap it is important to gather deep knowledge about the topic *before* a comparative design can be used, for example a cross-sectional research design. The single case study with in depth interviews and analysis was therefore chosen to be the most suitable design for the intended purpose and research questions of this thesis.

Consequently, and more specific to this master thesis the research design chosen for this thesis was a case study where the research questions was answered by exploring a specific case at Stora Enso and the supply chain organization within Consumer Board. Furthermore, the case study was conducted with a qualitative approach where data collection was tailored for a qualitative analysis. The nature of the study was explorative since the intent was, as described in the background, to initiate research that can fill the gap of theory concerning the link between interchangeability and CRM with emphasis on customer involvement.

There are different ways in which a master thesis can contribute to already existing or non-existing research, either by performing research with an *inductive, deductive* or *abductive* structure (Bryman & Bell, 2011). Bryman and Bell (2011) further suggests that if a case study is performed in a qualitative manner, it has an inductive approach. Since this research solely used a qualitative analyze method, an inductive approach was the natural choice for this study. However, the task given by Stora Enso required moving back and forth between theory and empirical results which resulted in a systematic combining of theory and results. This is a method called abductive reasoning (Dubois & Gadde, 2002), where theory and empirical findings lead to one another and the borders between them evolve throughout the study. Consequently, an abductive approach was used in this study.

Dul and Hak (2008) distinguish between theory-building and practice-oriented research. They explain theory building as a research where the researcher studies a particular situation to contribute in forms of new theory to the field of study. Dubois and Gadde (2002) suggest that

an abductive approach will develop theory which suits well with the purpose of this study. Consequently, this research will not create new theory that can be applied within many different areas. The notion is instead, as described in the introduction, to develop existing theory about the link between customer involvement and interchangeability. A practice-oriented research will therefore be used where the benefits are, as Dul and Hak (2008) describes it: a general contribution of knowledge to a specific practitioner, in this case the field of CRM, customer involvement and interchangeability.

One problem that is inherent when conducting research with a case study research design is generalization, i.e. external validity, of the study (Bryman & Bell, 2011). The question to ask is how a particular case can be representative for a larger population. However, this research is practice-oriented with the intent of not producing any generalizing theory but instead to develop existing theory and therefore it will not be of any concern to the quality of this study.

Dul and Hak (2008) conclude that a practice oriented research can be made in two ways, with hypothesis testing or without hypothesis. This research did not construct or test any hypothesis because the intention was not to provide any new concepts. Instead, this case study was a form of revelatory case (Bryman & Bell, 2011). The phenomenon was not unique and unexplored but as Dul and Hak (2008) write, a practice oriented case study is suitable for a situation where one wants to study variables from a specific point of view concerning a known theory or phenomenon.

A case study that relies on the type of analysis, either quantitative or qualitative, can often be mistaken for a cross-sectional research design (Bryman & Bell, 2011). Furthermore, Bryman and Bell (2011) describes a case study as a study that explores an object in its own right meanwhile a cross-sectional study is designed to gather data from different instances and compare them. Since this study only focused on one case at Stora Enso and the interchangeability within this one organization it cannot be mistaken for having a cross-sectional design, which is also strengthened by the definition given by Dul and Hak (2008).

3.1.1 Outline of the Research

The outline for a practice-oriented case study (based on Dul & Hak, 2008) is shown in Figure 2. The figure also shows the proceedings for the research.

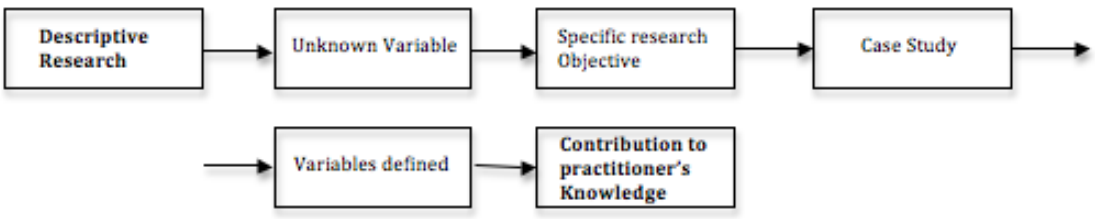


Figure 2: Schematic picture of the outline of the research (based on Dul & Hak, 2008).

The outline suggested by Dul and Hak (2008) is similar to this study, not identical, and acted as a mindset for how this research was conducted. Meaning that the steps presented in the picture is not the exactly the same as the different steps in this thesis. However, the idea where the researcher starts broad and later specifies into a specific research question and study are the same and therefore still relevant. As a foundation for the study it is important to understand the case in question, hence a descriptive phase at first where the goal is to help the reader grasp the environment and the topic in question. As a second step all the possible variables and data that can affect the overall research objective are to be studied so that a specific research objective can be determined (third step). In the fourth and fifth step, the specific case and its specific variables are studied in detail so that the research can contribute with important knowledge and insight to the dimension of interchangeability and customer involvement and eventually lay some foundation to new theory connecting these concepts.

Since an abductive approach was chosen the linear model will not be perfectly suitable for explaining the work progress of this master thesis but it is important, both for the reader and the researcher, to have a linear approach in mind to not create an argumentative loop. This means that the research will avoid to motivate theory based on empirical findings and the other way around which is one of the pitfalls by doing abductive research (A. Dubois & L.E. Gadde, 2002).

Even though the mindset and the progress is supposed to have a linear structure, the results of the thesis will be better described in Figure 3. Where the case is an essential part of the overall research but with classified information excluded from the thesis, hence the intersected circles.

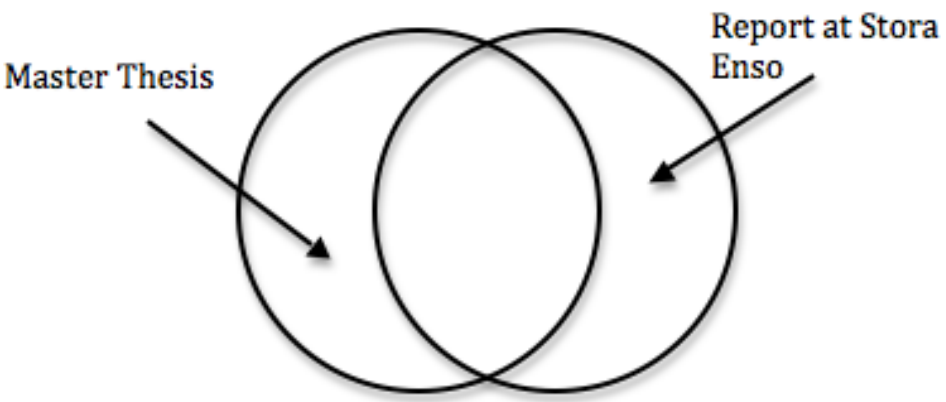


Figure 3: The figure shows how the deliveries of the thesis are structured in a confidential part (Stora Enso) and a public part (Master Thesis).

The main reason for using this format is because the deliverables are somewhat two-folded, (a) one more consultant based report (the case) for Stora Enso where the questions are studied and answered to maximize the usability for the company; and (b) a research based report where the main takeaways from the case, related to the formulated research questions, will be examined with relevant literature to answer the research questions.

3.2 Research Method

Data collection combined with literature studies was made according to the first four steps in the linear research progress presented above; descriptive research, collection of variables, creating specific research question and the case study.

The main method for collecting data in this research was chosen so that a qualitative analysis could be made in the end. Interviews are the most common way to gather information in a qualitative study and it is because of the flexibility of the data collection (Bryman & Bell, 2011). This master thesis based most of its conclusions and analyses on data gathered from different types of interviews. A total amount of 16 interviews were conducted to secure the relationship between factors inherent in customer involvement and CRM and how they affect well-established organizations' interchangeability and production flexibility. The sampling of the interviews was mostly based on recommendations from the company supervisor. However, the sampling was also based on what was the outcome of the former interview, what topics the authors felt needed to be further explored. Therefore, the company supervisor acted as a mediator and provided the names of the people with knowledge about specific topics. The specific interview methods used for data collection were unstructured interviews (7), semi-structured interviews (3) and structured interviews (6). A field study in form of a visit to Skoghall mill was also conducted to gather data for the thesis.

3.2.1 Descriptive Research

As stated before, the research design and strategy shown to be abductive with a qualitative approach. The research started with a descriptive phase with the purpose of understanding the company Stora Enso and its environment. Bryman and Bell (2011) describes interviews in a qualitative research as detailed, flexible and rich. Therefore, in the pre-phase of this thesis it was important that the interviews provided rich and detailed information about the current situation. This step was crucial because the outcome of the following step, the literature study, would not be representative and valid if the interviews were badly conducted in the first step.

In the pre-phase, the project leader at Stora Enso responsible for the internal interchangeability project was interviewed in an unstructured manner (the project is described in chapter 4.3). Also, the person who served as a supervisor for this thesis was interviewed. The choice of using an unstructured way of gathering this data was because, as a start, it was important to explore key persons' views and interests in interchangeability quite openly.

These interviews turned out to be structured more as normal conversations, which Bryman and Bell (2011) points out as one of the properties of unstructured interviews.

The two introductory interviews were held for about one hour each over the phone. The questions were broad and served the main purpose to get the interviewed persons to start talking about what they considered important in relation to interchangeability. Questions that popped up during the interviews were asked right away and hence the conversational feeling. The interviews were recorded and transcribed for no information to get lost. The outcome of this first step then lay as a foundation to the next steps, the literature study and further interviews.

As a next step in describing the environment at Stora Enso, unstructured interviews with supply chain managers at Imatra, Fors and Skoghall mills were held. In order to get a thorough and in-depth description, as needed for a case study according to Dalen (2007), an unstructured approach was used also in these interviews. It was also important to streamline the methods for collecting explorative data at the three different production sites. Bryman & Bell (2011) suggest that if comparability between different data should be achieved, the same method should be used. However, it is more suitable to use semi-structured or structured interviews rather than unstructured interviews to easier gain higher comparability. The researchers realized that it was necessary to interview supply chain managers again and use a more structured approach further on in the process, this was done in step four in the progress of the research. Important to note is that these interviews were also recorded which enabled for the researchers to go back and listen to the interviews later on in the process.

The next necessary step in understanding Stora Enso, Consumer Board and the research topic required two semi-structured interviews to be conducted. What was needed before entering next step, consisting of collecting information about what affects interchangeably and customer relations, was an understanding of the costs and beneficial factors connected to the supply chain. Due to the fairly specific topic and flexible nature of the information needed, semi-structured interviews were chosen, this is also proposed by Bryman & Bell (2011) for these intentions. Interviews were held over phone with a supply chain manager, approximately 40 minutes, and a technical support person, approximately 40 minutes, at the Skoghall mill. Both interviews were recorded and transcribed.

In the last and final step of this descriptive part of the research a study visit was conducted. Both the researchers, the project leader for the internal interchangeability project and the supervisor at Stora Enso felt it necessary for the researchers to see at least one production site in order to get an understanding of how the machines work and how operations are carried out on site before collecting data about how customers affect production and interchangeability. The field study took place at Skoghall mill for one day. Meetings were held on the site with

the project leader, the supply chain manager, two segment development managers, a technical support person and two persons with great knowledge about the production systems.

3.2.2 Collection of Data

The outcome of the descriptive phase acted as input to this phase where the project leader and the supervisor expressed the importance of examining customer involvement in interchangeability. Consequently, the variables in customer relations that could affect interchangeability was needed to be more thoroughly investigated and compared between different customers. Therefore, a structured approach was needed and, more specifically, structured interviews were required.

This particular information collection method was motivated by two separate arguments. First, the persons interviewed had very demanding jobs, which meant that they were often busy. Instead of using an in-depth method such as semi-structured or unstructured interviews, the structured approach would be more time efficient. Second, the structured approach has a higher degree of comparability between the different respondents (Bryman & Bell, 2011) than the other two interview methods used in the study. That characteristic of the data is necessary when exploring and analyzing the relationship between Stora Enso and its customer in different segments.

Consequently, structured interviews were used to gather information about the relationship between Stora Enso and its customers. There were two categories of employees relevant to interview concerning this topic. (1) Key Account Managers (KAM) responsible for larger customers, and (2) Segment Development Managers (SDM), responsible for customer concerns in a specific customer segment. Both categories have daily customer contact, which also justifies the sample. The supervisor and the internal project leader at Stora Enso provided names and suggestions of KAM's and SDM's to contact.

The structured interview guide for this step was created and revised jointly, using a pretest, with the supervisor at Stora Enso. Feedback on content, length and language was provided. The reason for jointly developing and pre-testing this interview guide was to secure a relevant outcome from the interviews both from a researcher's point of view and for the purpose of creating value for the company.

Out of five available SDM's, all five were interviewed with a time limit of around 15 min. Out of three KAM's only two were interviewed, mainly because of time issues and because the third KAM was responsible for a customer that was not of primary interest for this thesis. All interviews were conducted by phone, they were recorded and later transcribed to secure that no relevant information was lost.

After six structured interviews were conducted, one 50 minute long semi-structured interview by phone was held with the purpose to gather more in-depth knowledge about the interaction between a specific customer and Stora Enso. The person interviewed was one of the KAM's earlier also interviewed in a structural manner. The reason for choosing to interview this specific KAM more in-depth was because he was handling a relationship between a certain customer and Stora Enso with a very high degree of interaction. Interviewing this KAM was therefore perfect for evaluating how the interaction works, what values that are the drivers in such a relationship and how a higher degree of interchangeability would affect the relationship. The questions were developed beforehand together with the company supervisor. However, due to the nature of the interview some questions that were not included in the interview guide were asked in the situation.

Before the in-depth interview with the KAM an idea of a specific part to be studied was created, namely, interchangeability in the form of "movement of a certain customer's production from one site to another". However, this idea was proven to be very difficult to both research and practically implement without professional knowledge about Stora Enso and their processes. Consequently, the idea was scrapped.

3.2.3 Revising the Research Questions

After collecting information concerning what affects production interchangeably and gaining more in-depth knowledge about customer interaction and involvement the next step consisted in nailing the exact purpose and research questions for the study. The questions were slightly revised and reformulated based on the outcome of the interviews in the two previous steps.

As a final step in this phase, a telephone discussion was conducted for about one hour with the supervisor at Stora Enso and the project leader for the internal interchangeability project. In this conversation the available findings as well as what affects customer involvement and interchangeability were discussed and a more specific idea of the final delivery was presented. It was decided that the study would examine historical events with customer involvement that had enabled increased interchangeability within the company and find the common ground for these events so that the company could use this for further motivating customers when increasing interchangeability. The thesis would also include an in-depth analysis of these events in relation to written theory on the subject. As a second delivery, the intent was to map the current interchangeability situation and what potential exists within the company. However due to secrecy, numbers and product specific data would not be included in the research but would only be delivered to Stora Enso.

3.2.4 In-depth Case Study

This step in the research served as the base for the analysis and the information collected concerned the deliveries determined in the previous section, analysis of historical events and

the current interchangeability situation. This step contained mostly semi-structured interviews and it was necessary to again address previously interviewed individuals, but with new questions more focused on the specific deliveries. This aligns with the viewpoint of Bryman & Bell (2011) that interviewees in a qualitative study tend to be interviewed more than once.

Recommendations on who to interview yet another time was given by the company supervisor and the project leader of the internal interchangeability project. To map the situation today, Supply Chain Managers and KAM's at all three different production sites (Imatra, Fors and Skoghall) were contacted again. The interviews were semi-structured and around 25 minutes long with questions concerning the actual interchangeability but also the potential future interchangeability. The exact figures cannot be presented due to secrecy. However, a discussion about the situation today was made which was necessary for the analysis of the historical events. Some of the interviews were also followed up by questions sent by e-mail.

For finding out about historical events that could be useful when motivating increased interchangeability towards the customers, two semi-structured interviews were conducted, one with previously mentioned SDM, 30 minutes, and one with previously mentioned KAM, 40 minutes. These particular persons were selected because they had information and experience from two events, development of a new product and the threat of a complete stop in production. These were events that lead to a change in production and flexibility in some way. The interviews were recorded and fully transcribed to make sure that no information was lost when analyzing the events and finding the common denominators.

3.3 Qualitative Analysis of the Data

In a qualitative research it is often hard to create meaning and understanding among the large amount of data collected (Bryman & Bell, 2011). Throughout this thesis the data collection and interview transcripts constituted the largest and most important part. The abductive approach made it impossible to first gather all data and then afterwards analyze it by comparing or using some measurement weighting it. The authors realized early in the research process that the data had to be analyzed during the research process, which pointed toward that the analysis followed a grounded theory approach.

The variety of the different interview styles used made it hard to create one template for coding and analyzing data. The approach used for this was a type of comparison where the authors, according to the proposed research outline mentioned above, broke down the interviews into smaller pieces and made interpretations and comparisons of what variables were important with respect to interchangeability and customer involvement. This analyze method is a consequence of the proceedings and the snowball sampling method described by Bryman and Bell (2011).

The question of what type of sampling method was used must be answered by something more than a snowballing method. Due to continuous analysis and coding of the gathered data, it was impossible to use a complete objective snowballing sampling. Therefore, in retrospect, the authors realized that a combination of *theoretical sampling* (Bryman & Bell, 2011) and snowballing was used. This means that collection of new data in the process was not only decided by snowballing but was also based on previous analysis and coding of the already gathered data.

One matter that needed to be attended was, as mentioned above, the variation of the different interview methods used. While unstructured and semi-structured interviews were analyzed and coded with open coding, structured interviews must be more comparable. In this case the questions were designed to provide answers to specific thoughts about customer involvement. After that, the interviews were divided and compared within each customer segment to highlight similarities and differences in these categories, which is the base of the section large/small customers in the case description (Chapter 4). Lastly, these findings were compared with each other to see what can be used in order to motivate customers and increase interchangeability for Stora Enso, regardless of segment and size.

3.4 Research Quality

The research quality, design, data collection and analyze methods will be discussed from the perspective of *generalization*, *validity* and *reliability*. Since this study only has a qualitative approach it becomes problematic to discuss it in terms of validity and reliability (Bryman & Bell, 2011). Bryman and Bell (2011) further states the relevance of using these terms since they are defined to ensure one truth that is measurable. The case study at Stora Enso did not include gathering material in a quantitative manner (statistical figures) which means that these quality measures are questionable. Even though these measures are questionable in this case, the quality of this study will be assured in relation to these quality measures.

First, as mentioned in the section about the research design, there is a problem of generalization from a single case study (Bryman & Bell, 2011). It is an inherent flaw in this research design and it is well-known. Therefore, the intention is not to create theory and models that are applicable regardless of setting. On these grounds the outcome of this study will be limited from a generalization point of view. To be able to generalize these findings it is important to also conduct a comparative research involving variables such as the specific components, products, size of the organization and degree of customer involvement. Dalen (2007) writes that a qualitative study based on rich in-depth interviews gives another dimension to generalizability than quantitative methods but according to Bryman and Bell (2011) this is referred to as the internal validity. Since this master thesis is constructed in a qualitative manner it can be relevant as a basis for further comparative studies in which theories can be created and higher external validity can be reached.

Another problem with a case study research design is replicability (Bryman & Bell, 2011). Bryman and Bell (2011) states that it is almost impossible to replicate a case study because of its specific properties in a particular moment. This problem relates to the ability to conduct further research on this topic, hence the importance of being able to replicate the study to draw general conclusions. However, both Bryman and Bell (2011) and Dalen (2007) suggests that a thorough and in-depth description of the case is a prerequisite to create strong replicability. Thus, this master thesis contains an accurate and thorough case description related to the thesis scope of customer involvement and interchangeability as well as detailed descriptions of what has been done and how it has been done. For example, for this study to be replicated correctly the interviews must be done by phone because this thesis has been conducted in such way. However, it would probably be preferred to conduct the interviews person to person but due to cost, time and geographical issues it was not a possibility in this study.

An abductive approach is not problem free but also has some issues that have to be addressed in order to assure the quality of the research. According to Dubois and Gadde (2002) there are three issues that have to be addressed, '*sampling process'*, '*theory generation'* and '*conformation can be inseparable and to do everything results in nothing'*. In relation to this master thesis at Stora Enso two of these issues need to be addressed. The sampling process, mentioned above, is a snowballing method that contains theoretical sampling and it was based on discussions with the supervisor at Stora Enso to ensure the quality of the information from the persons interviewed. The second is that it has to be ensured that this thesis does not end up describing everything and land in nothing. This issue was addressed in section 4.1.1 where the intention was to use a linear mindset to separate empirical findings and theory and not motivate each other based upon the other. The third, *theory generation,* does not need to be addressed because the intent of this study is not to generate new theory.

To assure the quality of the outcome from the interviews a form of triangulation was used. Triangulation means using more than one method of gathering data in order to validate the data (Bryman & Bell, 2011). To understand the complexity of the case it is important to understand how the production sites at Stora Enso are connected and what properties are unique for each site and therefore the "same" person, the supply chain manager, at each production site was interviewed to validate the information between one site and another, especially regarding the concept of interchangeability. Further, to validate the specific characteristics important for the customers, different key account managers and segment development managers were interviewed. The means of gathering data that are triangularizable the collection will be divided into semi-structured and structured interviews and also analysis of secondary sources. By using a variety of data collection methods and interviewing different people the outcome will be triangulated to some extent. This

triangulation is important both from a research point of view and for Stora Enso since the results must be usable and applicable within the whole company and serve as a base for further research.

In a case study with qualitative data collection it is emphasized that the data is properly documented. To avoid researcher bias the interviews are recorded, as long as it is okay for the person interviewed, and afterwards the interviews are transcripted in detail. This will also enhance the descriptions in the thesis and create links between conclusions drawn and the data collected which Bryman and Bell (2011) point out as one important aspect for securing the quality of a qualitative research.

4 The Case Study at Stora Enso

This chapter will deal with the specific case to be studied, namely Stora Enso Renewable Packaging and more specifically the Consumer Board segment and its supply chain organization. In this chapter all important facts that will act as a foundation for the analysis and the conclusions will be presented.

4.1 Stora Enso Renewable Packaging

Stora Enso is a leading company within the paper, biomaterials, wood products and packaging industry with 28 000 employees in more than 35 countries worldwide. The company was formed by a merge of the Swedish mining and forestry company Stora and the Finnish forestry company Enso Oy in 1998 and has its headquarters in Helsinki, Finland.

The company operates within four major business areas; Printing & Reading, Biomaterials, Building & Living and Renewable Packaging. However, recently there have been some reorganizations for the areas, transforming them into three instead of four. This means that the two areas Printing & Reading and Building & Living have been joint into one division focusing mainly on mature businesses and geographies. The other two areas will remain as before and focus more on growth and innovation.

This master thesis will only focus on the business area of Renewable Packaging within Stora Enso and more specifically on the Consumer Board segment and product range. The Consumer Board product range includes liquid packaging boards, cigarette boards, graphical boards and other packaging boards intended for cosmetic and luxury products, chocolate and confectionery as well as pharmaceuticals and food products. The products within the Consumer Board segment are sold to industries all over the world. However, the end product is aimed for the consumer market and therefore the name consumer board segment. On the following page is a (somewhat simplistic) picture, Figure 4, which shows the supply chain for Stora Enso stretching all the way from forest owner down to end consumer.

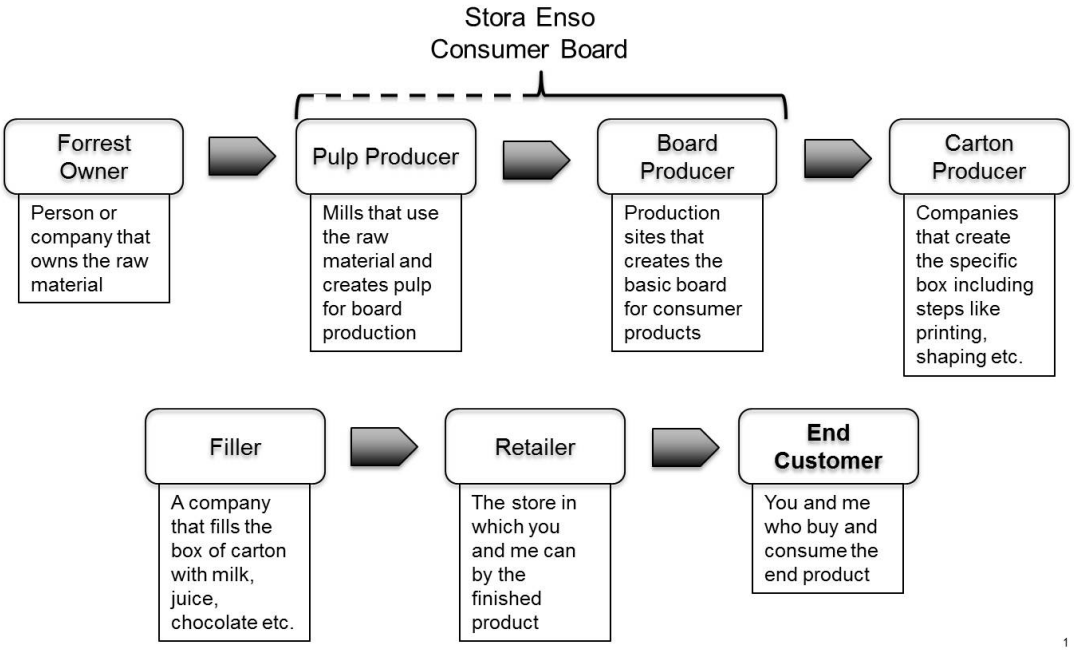


Figure 4: Value chain of Stora Enso Renewable Packaging

4.2 Consumer Board Supply Chain Organization

In late 2012, Stora Enso decided to re-organize and formalize the supply chain operations within Stora Enso Renewable Packaging and to do this they created a new organization entity called Consumer Board Supply Chain. The entity will have the main task to drive and improve three process areas; Demand & operations planning, Transport & logistics and Purchasing. Consumer Board Supply Chain will be run by a management team consisting of the vice president of supply chain, five mill supply chain managers, the head of sheeting and plastic coating and a supply chain specialist.

Within each mill there will be a supply chain unit consisting of parts of current sales and mill organizations such as market coordinators, production planners, logistics administration and warehousing operations and mill based purchasing staff. For all mills new ways of working will be implemented according to four so called drivers of supply chain excellence. The four drivers are the organization, performance management, the people and finally the way of working.

For the first driver, the organization, the goal is to establish a structure that looks the same in all units and that is applicable also to new units. For performance management the aim is to implement an efficient way of tracking progress and address deviations through common KPI's and improvement plans in all units. For the third driver, the people, the goal is to establish harmonized role descriptions and expectations in key positions. The last driver is the way of working and here the aim is to standardize the work and establish common ways of working in material and information flow processes within the organization.

But it is not only within these four areas there is a need for more unified ways of working, also the products and the production processes in the different mills are today quite diverse. The next chapter will go more into detail about this issue and it will also be explained what Stora Enso wants to achieve within this area.

4.3 Interchangeability Project

The business unit for Consumer Board is currently facing a number of challenges related to growing sales, geographical expansion and optimizing asset utilization. In order to prepare for these challenges and along with the creation of the new supply chain entity Stora Enso has started a project with the aim to increase the interchangeability within the organization. With increased interchangeability Stora Enso means the ability to produce a certain product in more than one production site, i.e. having interchangeable machines. To achieve higher interchangeability the machine and product flexibility have to be increased so that production can take place where it is most suitable and where available capacity exists.

Stora Enso has presented some reasons to why they want to increase interchangeability. First, it will enable them to accept new profitable orders. Second, it will minimize the risks if a machine has delivery problems, and third, it will make it possible to produce products where it is most cost efficient.

Today, there is very little flexibility in the organization due to two major reasons. First, the machines, the board pulp and the products produced at the different mills have quite different characteristics. Second, the customers are very much involved in and able to influence the processes at Stora Enso. Many of the customers have gone through time consuming qualification processes in order to certify a specific machine to produce their orders and it is written in the contract between the customer and Stora Enso that their orders should be produced in that certain machine at that certain production site. Also, strong relationships between a certain customer and a certain production site have been developed over time and product development has commonly occurred decentralized at each production site in collaboration with customers. Machines have been adapted and optimized to produce certain products and therefore machine characteristics are quite different both for machines within one production site but especially for machines at different production sites. These differences will most likely make the process of achieving higher interchangeability quite complicated.

4.3.1 The Steps of the Project

The project can be described as consisting of four main steps, see Figure 5 below, in which the interchangeability is investigated from different perspectives. In the first step the main task is to map the current interchangeability between the machines in order to find a starting point. In the second step the objective is to present a mapping of the products that are potentially interchangeable in the future without the need for customer interactions and

discussions. In the third step the objective is the same as the objective in the second step, but with customer interactions and discussions. In the fourth step the focus will change more towards investigating what changes are actually viable by conducting changes within the company. Technical changes will be looked into and evaluated as well as some risks, challenges and costs associated with potential changes. The steps are not dependent on each other in the sense that that one step has to be completed until the next one can be initiated. Instead, the different steps of the project can overlap.

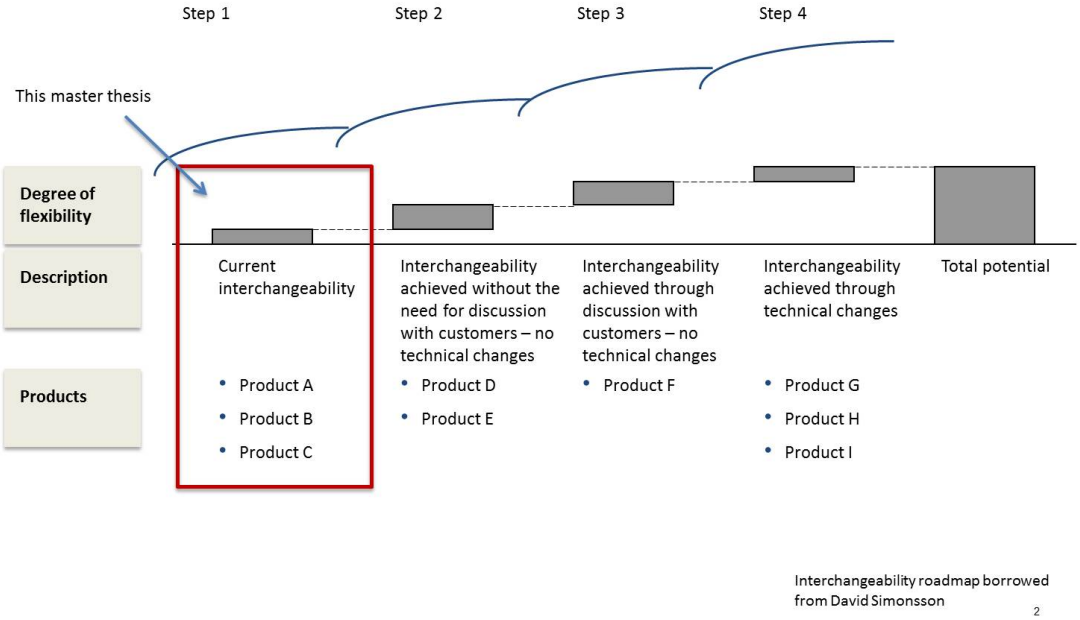


Figure 5: The steps of the internal interchangeability project at Stora Enso (borrowed from a presentation by David Simonsson, 2013)

4.3.2 Contribution of this Master Thesis to the Project

This master thesis will contribute to the interchangeability project majorly in two ways. It will contribute to the first step of the project by mapping the current interchangeability internally within and externally between the different mills. It will also contribute by looking into some ongoing interchangeability projects and a couple of historical cases and projects with a lot of customer involvement at Stora Enso. The objective of looking into some historical cases will be to investigate what kind of difficulties and challenges were experienced, mostly when it comes to customer interactions and involvement. By analyzing the results and drawing conclusions, the hope is that Stora Enso will be able to use this information in their work with achieving higher interchangeability.

4.4 Product Segments within Consumer Board

The Consumer Board product range can be divided into four main product segments; Liquid Packaging Board, General Packaging Board, Cigarette Board and Graphical Board. In this section the segments and the type of products within each segment will be described.

However, the specific product names will not be mentioned in accordance to confidentiality agreements with Stora Enso.

Liquid Packaging Board

In the liquid packaging board segment the products are mainly sold to companies producing and selling different types of liquids, commonly within the food industry. It could be for example dairy products, juices and soups but also different kinds of liquid detergents and fabric softeners. The primary requirement for this type of board is that the packaging keeps the content fresh and hygienic. The content cannot change in any way and has to be kept untainted for the entire life of the product. Especially for food products the regulations are strict since the consequences of a faulty product could be severe.

General Packaging Board

The general packaging board segment is probably the widest segment in terms of number of products for different end uses. The board is used for chocolate and confectionary packaging, cosmetics and luxury packaging, drinks, spirits and wine packaging, food packaging, pharmaceuticals packaging, cups and more. Also within this segment the regulations and demands from the customers are quite strict since it is important that the board does not transfer any smell or taste to the product contained.

Cigarette Board

The cigarette board is like the name suggests used for cigarette packaging. The cigarette industry is bound by a lot of legislations and regulations which is also noticed in the board production. Customers within the segment are usually quite involved in the production in terms of what chemicals and fibers are used in the board. They want to be sure that the components of the board are approved in the industry.

Graphical Board

The graphical board segment contains products used for graphical printing. The board is used for book covers, magazines, catalogues, postcards and much more. The segment differs somewhat from the above segments when it comes to regulations and customer demands. The product components are not as strictly controlled by the customer, however the physical appearance of the end product is very important. The surface of the board has to be smooth and bright and result in a good looking print. Today, the market for graphical board is slightly decreasing due to strong competition from the electronic industry.

4.5 Production Sites

Stora Enso Renewable Packaging has five production sites within the Consumer Board segment and these sites are located in Sweden (Fors and Skoghall), Finland (Imatra and Ingerois) and Barcelona. However, this master thesis will exclude two of the production sites, the site in Ingerois and the site in Barcelona. The Ingerois production site is excluded since it

has only one machine and currently no interchangeability with any other mill. The Barcelona production site is excluded from this thesis since it is not included in the interchangeability project within Stora Enso. In this chapter the remaining three mills in Sweden and Finland will be described in depth to create an understanding of the current situation at each production site.

4.5.1 Skoghall

The Skoghall mill with around 880 employees is located in Skoghall outside of Karlstad, Sweden. The mill has two machines for producing paper board called BM7 and BM8 where BM simply stands for board machine. The machines are basically quite similar but were constructed with 20 years difference. BM7 is the oldest one built in 1976 and renovated in the beginning of the 1980´s while BM8 was built in 1996. Some of the main differences between the two machines are that BM8 is larger, 8.1 meters compared to 5.4 meters, and it is built to produce board with a lower grammage. The grammage is the board density, i.e. the mass of the board per unit of area.

Board for two different segments is produced in Skoghall, the liquid packaging board segment and the general packaging board segment. Around 80 % of what is produced in Skoghall is liquid packaging board and around 20 % is general packaging board. Within each segment there is a certain number of product types with various characteristics such as grammage, bending stiffness and surface finish. All product types are produced on large rolls which are sold in different widths and lengths depending on what is requested by the customers. The two machines can both produce general as well as liquid packaging board.

Skoghall mill has its own factory for producing board pulp. There are two different types of pulp produced called CTMP (chemithermomechanical pulping) and sulphate pulp. Even though the most of the pulp used in Skoghall is produced by its own factory, pulp is also bought from other producers. For example, Skoghall buys Eucalyptus pulp from other producers and this pulp is used to produce board with better opacity.

The capacity utilization in Skoghall is high compared to the overall average of the three mills of 87%. For BM7 the capacity utilization in 2012 was almost 96% out of 290 000 available tons and for BM8 the number was slightly above 96% out of the maximum capacity of 450 000 tons. Today, it is even so that Skoghall cannot accept all orders due to no available machine capacity which means they have to reject a certain part of customer orders. Naturally this is something that Stora Enso wants to avoid and therefore there is a need for being able to move orders from one production site to another.

4.5.2 Fors

The Fors mill has around 700 employees and is located in Fors outside of Avesta, northwest of Stockholm, Sweden. Also this production site has two board machines. The machines are

called BM2 and BM3 and differ mainly in size and in terms of what products they are optimized to produce. BM2 is the smaller one of the two with a width of around 3.7 meters and an annual capacity of around 140 000 tons. The machine is almost entirely dedicated to producing general packaging board and graphical board but it also has the ability to produce cigarette board, around 5000 tons of cigarette board per year is produced in BM2. BM2 is able to produce board with grammages stretching from 180 up to 400 g/m2.

The second machine, BM3, has a width of around 5.4 meters and a capacity of 270 000 tons per year. Traditionally, the machine has only been able to produce rather low grammages, from 180 up to 240 g/m2, but there is currently a project ongoing at the site with the aim of increasing the grammage range. BM3 produces mostly cigarette board but there have been problems with maximizing the capacity utilization on the machine and Stora Enso therefore wants the machine to produce more general packaging board.

The Fors mill produces board for three out of the four Consumer Board segments, the cigarette board segment, general packaging board segment and graphical board segment. Fors does currently not produce any liquid packaging board. However, the mill has historically also produced liquid packaging board, mostly then on BM3. The cigarette board production stands for around 60 % of what Fors produces, while the general packaging board and graphical board production represents around 20 % each. The current trend is a slight decrease in sales in the graphical board segment and a slight increase in the general packaging board segment.

Fors produces two types of board pulp, both CTMP, used in the production. Traditionally Fors only used pine fibers but recently they started mixing pine with birch fibers, which are shorter, in order to get a board with a smoother and better looking surface.

In 2012, the capacity utilization was 91 % for BM2 and 84 % for BM3. For BM3 the capacity utilization is substantially lower than the one at Skoghall and also lower than the overall average within the Consumer Board segment.

4.5.3 Imatra

The Imatra mill is located in the southeast of Finland and has around 1000 employees. This is the mill out of the three that has the highest annual capacity and also the most number of machines. The mill has four board machines named BM1, BM2, BM4 and BM5. The machines differ with respect to size, capacity, what type of products they are optimized to produce etc. Table 1 below provides a more detailed view of the machines and their characteristics.

Table 1: Table of the machines in Imatra.

Machine / Characteristic	BM1	BM2	BM4	BM5
Year of construction	1950	1956	1961	1965
Width (m)	4.4	5.6	6.3	4.9
Quality upgrade	None	2004	2009	2008
Annual capacity (t tons)	175	250	320	260
Capacity utilization (2012)	78 %	78 %	80 %	91 %

As can be seen in the table, BM1 and BM2 had the lowest capacity utilization of 78 % in 2012. This number is also the lowest out of all capacity utilization figures on the three production sites. It is also below the overall average of 87 %.

Imatra is the only mill out of the three that produces for all four product segments. BM1 is almost completely dedicated to producing for the general packaging segment. The machine also produces a very small share for the liquid packaging segment but only around 1 % of the total. BM2 differs from the other machines since it has a so called clay coating option and can produce board with a clay coat on both sides of the board. The machine currently produces for all segments except the liquid packaging board segment. However, it is possible to also produce liquid packaging board since the machine has the full technical capability to do so. BM4 is specialized to produce for the liquid packaging board segment. To increase the capacity utilization on BM4 some general packaging board is also produced on the machine. As well as BM4, BM5 produces a mix of liquid and general packaging board with a majority of liquid packaging board. Around 90 % is estimated to be liquid packaging board on BM5.

Currently, BM5 is over booked with orders and BM2 has free capacity while BM1 and BM4 are quite well balanced. The situation on BM5 can be explained by an increasing demand from customers in the liquid packaging board segment. To solve the capacity issues some projects are ongoing in order to increase interchangeability and move orders.

Imatra has its own integrated pulp production factory and all of the pulp used in the board production comes from this factory. They produce pulp from birch and pine tree and like Skoghall and Fors, Imatra also produces CTMP. They do not buy any pulp from external producers, on the other hand, they sell some of their pulp to other companies.

4.6 Customer Involvement

Stora Enso Renewable Packaging has more than X thousand customers all over the world including everything from small local businesses to large global players. Through the years

Stora Enso has developed close relationships with many of their customers involving them in product development and customizing products for their certain needs and requirements. This section is divided into three parts where the first two parts will deal with larger and smaller customers and their involvement in the company's processes. The third part will deal with a couple of actual historical cases for qualifying new products where customers have been involved in the processes.

4.6.1 Larger Customers

When Stora Enso defines 'large' customers they often refer to the customer's orders in terms of ordered tons and the frequency of ordering. However, there is not a clear cut between a smaller customer and a larger one. Stora Enso has a handful of customers that can be considered 'large'. Large customers placing large orders are considered very valuable, which therefore motivates having close relationships with them. Consequently, the largest customers also have a dedicated Key Account Manager at Stora Enso handling most of the interaction between the company and the customer.

A closer relation between Stora Enso and its customer suggests a high degree of customer interaction and a lot of customer demands, which also is the case. For larger customers there are a higher degree of customized products; Stora Enso produces a specific board that perfectly fits that one customers' processes. To reach such high level of customization there is a need for a close relationship between Stora Enso and its customer which makes them more involved in product development and production.

Stora Enso stresses the importance of customer qualification processes when a new type of board is to be sold. A qualification process means that a customer gets the chance to test the quality on certain important parameters for the intended usage of the board. Also, as mentioned above, customers test if the board fits their processes with minimal changes. To understand the importance of this qualification process the value chain must be considered. If an end consumer gets a package which contain for example some liquid and it leaks, the costs for Stora Enso as the board producer would be tenfold compared to if one of Stora Enso's direct customers discovered it. Due to this nature of the industry the qualification processes can be expensive and time consuming both for Stora Enso and their customers.

As mentioned before, the costs of entering into and performing a qualification process are high for customers, which can make it difficult to motivate such an action if the customer does not see the benefits of qualifying a new product. Only to shift the production from one machine to another will not motivate such an investment from the customer point of view. They usually have several other suppliers of board where they do not need to invest in a new qualification process to get the delivery.

4.6.2 Smaller Customers

The biggest difference between what defines a large and a small customer from Stora Enso's point of view is the annual tonnage ordered. The small customers are many more than those classified as 'large'. To be profitable Stora Enso cannot dedicate one machine and one product to one specific customer and therefore the rationale is that one product is meant for several customers. This situation becomes different than with large customers because the relationships are not as developed and as beneficial for Stora Enso even though the customers might think of themselves as large buyers of board and see the benefits of having a close relationship.

The consequence of having less tight relationships is less involvement in product development and production processes, which in turn gives Stora Enso the possibility to be more interchangeable and flexible. However the fact remains, there is still the need for a qualification process when selling new products or products produced in a different machine, no matter how small the customers are. This means that customers that are not as financially strong as others cannot always afford to enter into a qualification process and therefore choose another supplier if Stora Enso want to move production from one machine to another requiring a new qualification process at the customers' production site.

4.6.3 Cases with Customer Involvement at Stora Enso

This chapter will deal with two specific cases that took place at Stora Enso, both in 2010. The cases required the customers to qualify new products in their processes due to some specific events at Stora Enso. The cases were chosen since they involved a lot of customer interaction and they also deal with how to motivate customers to spend time and money on qualifying new products. They will therefore serve as a good base for analysis further on in the report.

Lack of Production on BM5 Imatra

In 2010 a new product within the general packaging segment was introduced. The product was related to an existing group of products that was already produced in Skoghall. However, the new product was not to be produced in Skoghall but instead in Imatra on BM5.

At the time before the introduction the sales forecasts for products produced at BM5 did not look very optimistic and Stora Enso predicted that the machine would have so little to produce that it would have to stand still for certain periods of time. This was not desirable and therefore Stora Enso wanted to introduce a new product on the market to be produced on BM5 in Imatra. A new product would lower the risks for production gaps on BM5. By doing market analyses and talking to customers Stora Enso found there was a demand for a new product within the general packaging segment that would be more fitted for a certain use compared to the existing products from Skoghall. The new product would have higher tear resistance than the existing products which was precisely what the customers were requesting.

During the first months of the development process the project was not highly prioritized and the work went rather slowly, but as the pressure rose and more and more production gaps were experienced on BM5 the project gained speed. From start until there was a finished product on the market it took about one year.

After having developed a first prototype of the product it was time for test runs, both within Stora Enso but also more importantly at the customer sites. In this case Stora Enso had two large important customers involved, test runs were made all through the supply chain down to end consumer in order to make sure the board was working properly in each step.

In order to get the customers on board for the project Stora Enso had to ensure them this was a product Stora Enso would invest in for the future. Customers were worried this was a product developed to solve a temporary problem and that it would later be removed from the market. Customers also saw benefits in Stora Enso developing the product since it would lead to more competition among the customers' suppliers. Customers were interested in having several suppliers since more competition would lead to lower prices.

Having test runs together with two large and well-known companies within the business worked as a good way of marketing the new product. Other customers would trust in the product because they knew that the big players had already approved of it.

Production Stop in Skoghall

One extreme case took place in 2010 when Stora Enso suffered from a production stop and was in need of moving production from one production site, Skoghall, to another site, Imatra. The consequences of the stop in production were expected to be severe on the customer segment liquid packaging. It could eventually lead to a full stop in board delivering, hence the need of moving production to another site. The task of moving products was shown to be much harder than it was estimated and there were obstacles to overcome.

The company saw potential moving products within the liquid packaging segment because historically the production had been moved from Imatra to Skoghall. This created the possibility of using former product specifications and thus shortening the qualification process for the intended customers. However, because Skoghall had been the primary production for the last couple of years the productions sites and the machines at each site had diversified and specialized on different board properties. This was proven to be a barrier hard to overcome since the customer demanded that the board fulfilled certain requirement caused by this specialization. For Stora Enso this meant that they had to change specifications and materials used in the machine in Imatra to fit the customer demands which lead to some complications to the ordinary production.

However, the production stop did not last as long as expected and the production was up and running again shortly after the customer discussions concerning a move of production had begun. Important to state in relation to this scenario is that the customer in question at first considered to enter into a qualification process in Imatra but then decided to place their orders with a competitor instead since the costs for a qualification were deemed too high.

4.7 Current Interchangeability

Today, there is some interchangeability both within mills and from mill to mill. In this chapter a mapping and explanation of the current interchangeability situation at Stora Enso will be presented. The chapter will also deal with what is currently done at each site in order to increase the existing interchangeability, in what ways are the customers involved and what are the obstacles experienced.

4.7.1 Internal Interchangeability

With internal interchangeability is meant having interchangeable machines for a product internally within a production site. All three sites have internal interchangeability to some extent. Below, the interchangeability within each site will be described in depth. However, the certain products that are interchangeable within each segment will not be specified due to confidentiality agreements.

Skoghall

In Skoghall, the production of several products can be moved internally between BM7 and BM8. More specifically, 7 products within the general packaging segment and 2 within the liquid packaging segment are interchangeable. However, there is a customer restriction which is important to bear in mind. This means that some, usually the larger, customers have certain demands regarding which one of the machines should produce their order at a certain time. Consequently, this means that there is a need for customer approvals before moving the production of certain products between the two machines.

Important to mention is also that even if the production of a product can be moved between two machines and the resulting products are considered interchangeable within Stora Enso, the specifications and recipes used usually differ from each other depending on machine. There might also be differing opinions among the customers concerning if two products are considered equal coming from two different machines.

It is also important to keep in mind that no customer would accept to get every second order from one machine and every other from another machine. The customers want consistent looking board with a consistent quality level. This applies to all mills and to pretty much every customer ordering frequently from Stora Enso. If customers agree to receive their order from another machine, it is either a very large order or for many orders during a long period of time, meaning usually several years.

Fors

Also Fors has internal interchangeability between the two machines BM2 and BM3. As mentioned, there has been a lot of work done recently in order to enable for BM3 to produce general packaging board with higher grammages and the work is still ongoing. Increasing the grammage range of BM3 would mean creating a higher interchangeability internally between BM2 and BM3 and it would also mean being able to utilize the capacity of the machines better. As for now, there are some difficulties with maximizing the capacity utilization on BM3 by only producing cigarette board.

Among the general packaging and graphical products, those products with a grammage below 240 g/m2 are today fully interchangeable between BM2 and BM3. For these products there has been a qualification period with the customers and the products from both machines are now approved by the customers. This means Fors does not have to inform the customers every time they make a switch from producing those products on BM2 to producing them on BM3 and the product specifications are pretty much the same for both machines. However, if Stora Enso would switch machine several times per year this would not be appreciated by the customers due to the fact mentioned in the previous section, that the customers want consistent products with consistent quality.

The cigarette board production is not at all interchangeable between BM2 and BM3 today.

Imatra

The largest part of the internal interchangeability in Imatra is between BM1 and BM4. Traditionally, BM4 is dedicated to producing liquid packaging board but by enabling some general packaging board production on the machine, BM4 can better utilize its full capacity. The products interchangeable between those two machines are only within the general packaging segment. The interchangeable products are not considered exactly the same but can in many cases replace each other depending on what the customers are demanding.

Imatra is currently working on expanding the interchangeability even more between BM1 and BM4 within the general packaging board segment. The aim is to achieve full interchangeability, meaning all types of general packaging products on BM1 should also be able to be produced on BM4.

The double clay coated products produced on BM2 cannot be produced on any other machine and therefore the interchangeability potential with this machine is limited. However, BM2 can produce some graphical products, but with a clay coat, that are similar to those produced on BM1. BM5 does not have internal interchangeability with any other machine in Imatra, however the machine has external interchangeability which will be described in the next section.

Compared to the internal interchangeable products at the other two mills, the interchangeable products in Imatra are generally not considered equal and the employees talk about *ability to replace* rather than having fully interchangeable products.

4.7.2 External Interchangeability

With external interchangeability is meant having two or more interchangeable machines at different production sites. Today this type of interchangeability is limited within the organization. The only current interchangeability between machines at two different production sites exists between Skoghall and Imatra. However there is potential for an exchange within a close future also between Fors and Imatra.

Skoghall - Imatra

Today, there is interchangeability between Skoghall and Imatra within the liquid packaging board segment. Eight different products can be produced either in Skoghall, on BM7, or in Imatra, on BM4. Additionally two product types can be moved between both machines in Skoghall and BM5 in Imatra. This does not mean that the production can be allocated wherever there is available capacity at a certain moment without any restrictions. But it does mean that some of the production, for certain customers, can be produced at either site which creates quite a high flexibility and allows for maximized capacity utilization.

There is currently work going on with moving even more production of Skoghall liquid packaging board products to Imatra in order to help relieve the full capacity situation in Skoghall. The technical equipment and the know-how for producing this board already exists in Imatra since the specific products were produced there some ten years ago. However, the development over the years have led to changes in the product specifications as well as changes in the machines and therefore a move of the production implies the need for thorough testing of the new material at the customers' sites. Even if Stora Enso is the driver of this production move, the customers are very much involved in all steps of the process and before production can actually start final approvals from the customers are needed.

Fors - Imatra

Right now there are no products that are interchangeable between Fors and Imatra. However, there is an ongoing project between the two sites with the aim of producing interchangeable cigarette packaging board. The specific board is today only produced in Fors but since Imatra also produces cigarette packaging board they have the necessary techniques and the knowledge to produce also this type of cigarette board. Because the machines in Fors and Imatra have some differences Stora Enso has not been able to reach exactly the same results and both kinds of products would still have to be qualified separately in the customers' processes. In case of an emergency situation Stora Enso would be able to deliver this type of board from either mill. This must however be agreed upon with the customers case by case.

Skoghall - Fors

There are several reasons for why there is currently no interchangeability between Skoghall and Fors. Firstly, because the machines differ from each other. Secondly, because the two mills produce somewhat different kinds of products. Thirdly, because different types of board pulp is used in the production. Lastly, because the knowledge and the specialization differs within the two mills due to historical development and limited information sharing between them. All these reasons together make it difficult for the two sites to produce a similar product, or at least it would require some time and efforts to achieve a product similar enough. It would also require customers to spend time and money on qualification processes to qualify new products. However, the interchangeability potential between the two sites is currently under investigation. As mentioned before, Fors has historically produced liquid packaging board and might be able to do so again. Stora Enso is also looking into the ability for Fors to produce similar general packaging products as produced in Skoghall. But these investigations are yet in a very early stage and not as developed as the other current interchangeability projects described in previous sections. Figure 6 below shows a picture of the total interchangeability at Stora Enso.

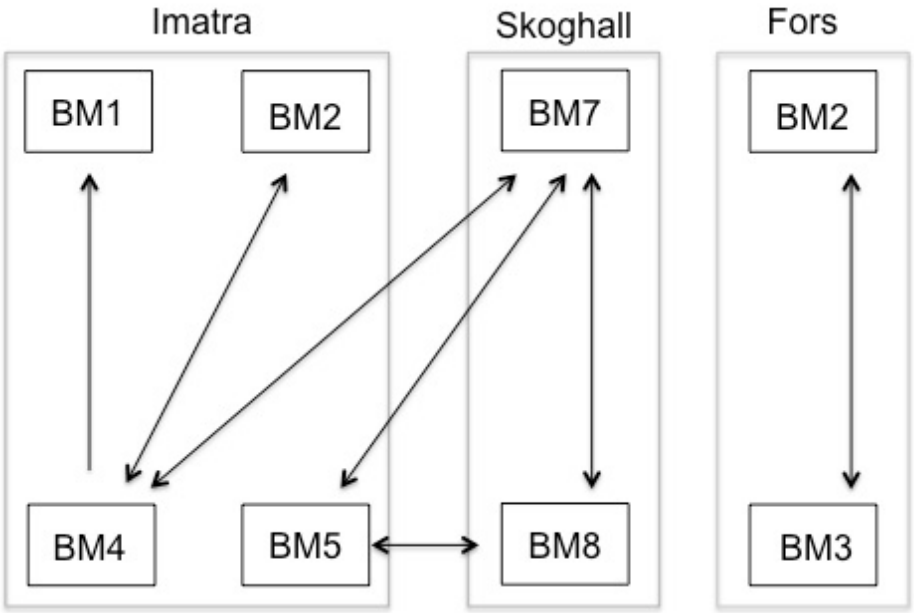


Figure 6: Interchangeability between machines at Imatra, Skoghall and Fors production sites.

5 Analysis and Discussion

This chapter is aimed at analyzing the above case, Stora Enso and Consumer Board, in relation to the theory presented in Chapter 2. The analysis covers everything needed in order to answer the research questions stated in the introduction. Throughout the analysis the theory acts as a key to sorting out facts and tie things together. Apart from serving as a base for answering the research questions the chapter also serves as a first and necessary step in filling the research gap identified and presented in the introduction.

5.1 Outline of the Analysis

To help the reader understand the reasoning of the analysis and how the authors have interpreted Stora Enso Renewable Packaging and customer involvement in interchangeability the outline of the analysis will be described. The last section in Chapter 2 - Theory helps the reader understand the choices and use of the theoretical findings pre this study and it will act as a guide and foundation for the analysis. Meaning, that the concepts will help explain the choices Stora Enso made and the analysis will have a "break-down-time-line" approach seen in Figure 7 where historical events sets the foundation and the interchangeability project at Stora Enso serves as a countermeasure to the rising interchangeability issue. Further, the concept and what it means for Stora Enso is analyzed related to existing theories. The second major part of the analysis is the topic of customer relationships which is discussed from Stora Enso's perspective and what strengths and weaknesses those relations entail. In the end, factors of motivating customers to partake in a qualification processes to increase interchangeability are analyzed from two angles; motivational factors in B2B-relationships and by looking back at historical events. These parts will later act as input for the conclusion and the answers to the research questions presented in Chapter 1.

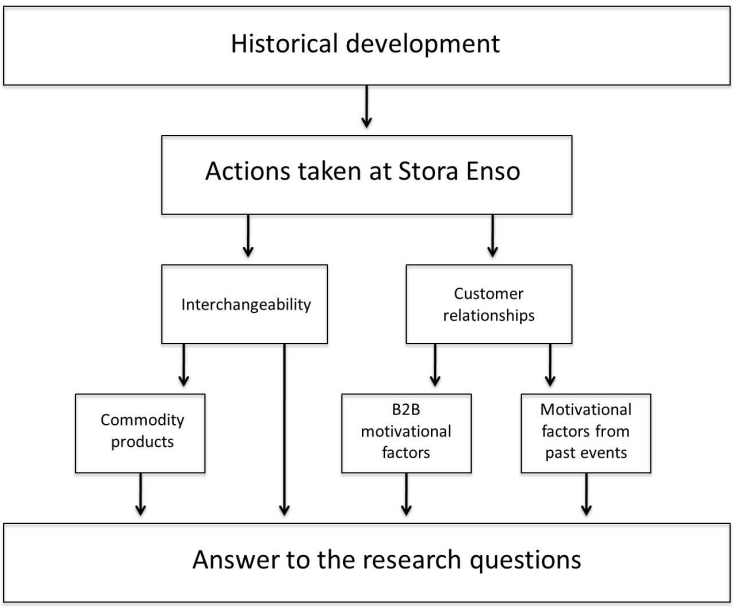


Figure 7: The outline of the analysis.

5.2 Historical Development at Stora Enso

Stora Enso and consumer board is an interesting case in relation to the stated research questions. However, to be able to answer them, the analysis of the case must be anchored in historical development of the company and its production sites. Such as, the size of the organization but also the merge between the Swedish company Stora and the Finnish company Enso.

From Chapter 4 it is evident that there are many differences between Imatra, Skoghall and Fors. The first difference in need of discussion is the different product segments, all sites produce for different product segments with only Imatra focusing on all of them. This is due to that historically Stora Enso and Consumer Board has taken a decision to specialize their production sites and capture know-how to ensure towards the customers that the board is of high quality. Therefore it is evident that the knowledge has been decentralized, as Alphonso et al. (1992) proposed. This development is also in line with Dorothys (1992) arguments of creating core capabilities on all four dimensions, (1) knowledge and skill, (2) technical system, (3) managerial skills and (4) values and norm. The situation of decentralization and specialization is evident during interviews where persons that were interviewed on different sites had different knowledge about the products, different technical skills and beliefs of what were important, e.g. printing abilities or bending stiffness. Examples of this are seen from two interviews where one said "I have good knowledge about the machines at this production site but not about the other within consumer board"[3] and "at Skoghall we are better at making board with good bending stiffness meanwhile Fors has machines adapted to creating board with good graphical properties"[4]

Dorothy's (1992) argument about core capabilities leads the analysis on to the next difference which is the technical factors at each separate production site. As presented in the case description, the sites have different numbers of board machines, the machines are built in different years, the properties of the paper pulp differs and the machines are designed to match certain specific quality criteria. "In this industry the board is highly specialized so if we lose our specialization we must compete on price which rarely is profitable"[5] and therefore, this structure is a necessity for ensuring the quality and specialization of the board produced, which in line with the above quote throughout all interviews is highlighted as Stora Enso's largest competitive advantage. The flipside of such decentralization, according to Dorothy (1992), is that cross-sectional functions and knowledge transfer within the company will be hampered. This effect is also evident through the interviews, were comments like "that is not my area of expertise, I think you need to talk to X at production site Y" were common. This

[3] Technical Support Person, interviewed on 2013-03-07
[4] Technical Director interviewed on 2013-03-27
[5] Ibid, interviewed on 2013-03-05

situation is one of the consequences of the merge between Stora and Enso, where different values and capabilities were combined into one large company. The second reason is, as stated above, because of the actual decision to decentralize, capture and build know-how about specific customer segments at each production site.

Due to this specialization and the conditions and properties of the machines at the different production sites, the R&D development has been tied together with the production. Ketokivi and Ali-Yrkkö (2009) goes as far as to state that this is rather a rule than an exception and that the merge of production and R&D can lead to a state in which it is impossible to unbundle the two functions. This is evident in this case and one SDM said during an interview "All new product development projects are done in cooperation with our customers"[6], however if it depends of the nature of the industry or the company's choices of how to perform these operations, is further developed later on when analyzing customer involvement in production and R&D.

This development has caught the attention of the management team in the consumer board unit. Therefore, they created the new supply chain organization in 2012 with the purpose of streamlining the supply chain activities between the different production sites. This is in line with Sanna-Randaccio and Veulgelers (2007) point of view, where transferability of know-how within in an organization is important for the company's profitability. They also state that it is hard to gain high transferability of knowledge in a decentralized organization. Since Stora Enso's Consumer Board can be classified as such it motivates the creation and formation of the new supply chain organization.

5.3 Interchangeability Project

After the formation of the new supply chain organization focus has shifted towards increasing capacity utilization over the whole business unit of Consumer Board. Today, there are large differences in capacity utilization between the productions sites, where some have orders that cannot be produced while other sites have quite of free capacity. This is not optimal for the overall profitability and as Coelli et al. (2002) describes, there is a connection between capacity utilization, inherent in the production, and a company's profitability. The situation has been realized among managers within Consumer Board and something has to be done to solve this issue.

There are different definitions of capacity utilization, one engineering approach saying it is the maximal output achievable under normal conditions (Klein & Long, 1973), and one economic approach, which also focuses on economic variable costs such as energy costs (Berndt & Morrison, 1981). The numbers for capacity utilization presented in Chapter 4,

[6] Segment Development Manager 1, interviewed on 2013-03-27

gathered from Stora Enso, are calculated with the engineering approach. However, Stora Enso has made it clear to the authors that the economic view is not to be neglected but that part is not included in this master thesis.

The topic of capacity utilization is not only interesting with profitability glasses on, even though most of the arguments boils down to a question about revenue versus costs. It is also interesting because the company is facing new decisions and challenges concerning geographical expansion, growing sales etc. These changes can be connected to Klein and Long's (1973) definition where the 'normal' conditions are changing which in turn means that the topic needs to be highlighted.

Regardless of what definition was used or what the motivators were, the decision to increase overall capacity utilization was taken, and by doing so the question of how interchangeability can be increased was raised. Thus, the internal interchangeability project was launched as described in Chapter 4.

5.4 Interchangeability at Stora Enso

Before any work related to increased interchangeability can be carried out, consent within the company about what the concept means and what it entails must be established. This means that this section is about Stora Enso's view of interchangeability. Throughout interviews with SDM's, KAM's, SCM's and the supervisor at Stora Enso it was clear that interchangeability is a complex concept, and it is even more complex what it entails. One SDM explained that "Product A can be replaced by product B but not the other way around"[7] and this is just one example of the complexity of interchangeability. This is in line with what can be seen in the literature where different authors have different definitions of the concept and its implications. The most common and simplest way to define it, given by people at Stora Enso, is that interchangeability means the production of one type of board can be moved from one board machine to another, regardless of if it means between production sites or within production sites. This definition is in line with the definition given by Cambridge Dictionaries Online (2013). The logic would then be to define it as Watts (2009) proposes, for something to be interchangeable no alterations or changes should have to be made to the item. Also this is supported by persons interviewed within Stora Enso, but how to reach that goal, having no alterations, is yet to be determined.

Discussion around the topic of interchangeability, to reach the goal of increasing the production flexibility, ends up in two folders; customer interaction and technical changes. It is evident that these two folders are the basic foundation for how to reach the goal, therefore, an overview of the steps has been created by Stora Enso, see Figure 8. This thesis will only look

[7] Segment Development Manager 2, interviewed on 2013-05-21

at the customer part, as described in Chapter 4, meanwhile the internal interchangeability project will focus more on the technical aspects.

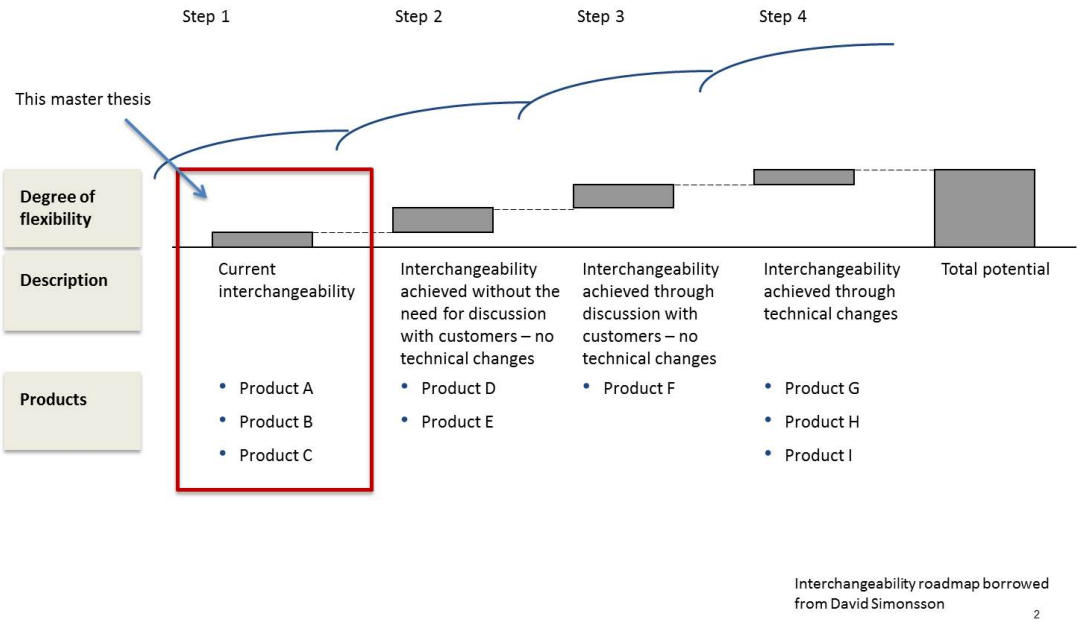


Figure 8: The steps of the internal interchangeability project at Stora Enso (borrowed from a presentation by David Simonsson, 2013)

With Watts' (2009) definition of interchangeability Stora Enso would have no interchangeability at all. However, this thesis or Stora Enso does not have that absolute view. Therefore, the definition of semi-interchangeability presented by Henrich et al. (2007) is more suitable. "Perhaps it is not possible to reach full interchangeability but some form of artificial interchangeability where we can replace one product by another"[8], with this quote and the data gathered from the case it is clear, due to the level of customer involvement, that it is impossible to have full interchangeability at the moment but potentially possible in the future.

The last concern about interchangeability is about what counts as interchangeability; Is it interchangeability when you can replace a product with another?, Is it interchangeability when you move the production and basically change product? The discussion within the company ends up in that something is interchangeable when you can move production both ways, either by replacing a product with another, produce the exact same (if possible) or change product specification so it fits customer needs.

5.5 Ending Up with Commodity Products

Having decentralized product development in close relation to customers might be a competitive advantage since it means having the ability to customize products exactly to customer needs. It is most likely also a competitive advantage to have each production site specialized at producing different products for different segments and customers. Important to

[8] Vice President, Supply Chain Organization, interviewed on 2013-04-12

consider here is that increasing interchangeability in a way can mean decreasing specialization. The extreme scenario would be increasing interchangeability to the extent that all products can be produced in all machines at all production sites. Such a situation would enable for the overall capacity utilization to be quite easily maximized, at least in theory. But what would this lead to if considering Stora Enso's competitive position on the market? If Stora Enso would lose their specialization and fail to share the local know-how with the rest of the company they could eventually find themselves in a situation where products are no longer considered exclusive by the customers. Instead, the products could end up as commodity products competing only on price. This is something that is important for Stora Enso to keep in mind when working with increasing interchangeability.

5.6 Customer Relationships

First there might be need for a clarification of how customer relationship management is defined in this study. When talking about CRM here it is not meant using complicated IT tools or establishing virtual customer interaction centers. Instead, the view is more similar to the one presented in the article by Chen and Popovich (2003), where they view CRM as a more holistic and strategic approach to developing relationships and retaining customers. Developing close relationships with certain customers is something that has clearly been an important part of Stora Enso's strategy. It has even in many situations been absolutely necessary for Stora Enso to have close customer relationships in order to be able to develop customized products. Without the close relationship it would have been very difficult for Stora Enso to stay competitive and acquire and retain the large customers in the industry.

Theory says that recent movement has gone from using many suppliers towards developing and maintaining in-depth relationship with fewer suppliers (Ulaga, 2003; Kalwani & Narayandas, 1995). In this case, Stora Enso is the supplier which means the recent development speaks in favor of them, suggesting that also the customers see the benefits of developing a close relationship with fewer suppliers and want to invest in their supplier relations.

There is however important differences between Stora Enso's relationships with small and large customers. Due to the fact that several of the larger customers have developed their own customized products together with Stora Enso these relationships are very close. Also, the large customers of course have a great value for Stora Enso due to the large volumes ordered which motivates Stora Enso to invest more in these relationships. Furthermore, a close relationship means a larger customer involvement and a greater ability for the customers to affect the processes at Stora Enso. The smaller customers, i.e. the customers with smaller order values, do generally not have as developed relationships with Stora Enso. However, the smaller customers together constitute an important mass, especially within certain segments,

but maintaining close relationships with every one of them would of course not be viable in the long run.

Several of the larger customers have been customers to Stora Enso for many years, usually decades, which over the years has led to close relationships. These long term relationships have commonly developed between a customer and a certain production site within Stora Enso, meaning that R&D projects have commonly been decentralized at production site level. Here it becomes interesting to look at the trade-off described by Sanna-Randaccio and Veulgelers (2007) about allocating R&D activities and resources centrally versus allocating them in close proximity to the market. Historically, R&D projects have been located where the specialization has existed, that is, decentralized at the production sites. This has led to the development of local know-how that has not been transferred to the rest of the organization as explained earlier in the analysis.

The issue here is that the new product development (NPD) has to be carried out in close relation to the production due to the nature of the industry. The board production is a complex process where testing of new material and adjustments in the machines has to be carried out continuously during the NPD process. And this is not only the case at the production sites within Stora Enso, but testing and machine adjustments also have to be carried out at the customers' production sites in order to make sure the material fits in their processes. So even if R&D was moved to a more centralized level it is important to keep in mind that a lot still has to be done decentralized at the production sites.

5.7 Customer Switching Barriers

As mentioned above, the customers, both large and small, have to ensure the products bought from Stora Enso fit in their machines and processes. This means quite a high cost (qualification cost) for the customers every time they buy a new product. It also means that Stora Enso is quite restricted when it comes to performing changes, i.e. recipe changes, changes in the pulp or technical changes in the machine, which might alter the product in some way. Switching production from one site to another would mean making all those type of changes and consequently also an alteration to the end product. The alteration could be more or less evident or meaningful depending on the type of customer and the customer requirements. Regardless, it would in most cases mean the customers have to enter into a qualification process for the altered product.

Switching barriers, defined as any factor that makes it more difficult or costly for customers to change providers (Jones et al., 2000; Blut et al., 2007), are absolutely present in the board production industry. Stora Enso has created switching barriers for their customers by creating close customer relationships with their larger customers and by developing customized products for them. The qualification costs also constitute a large switching barrier, both for

large and small customers, preventing them from switching to another supplier. However, in this case where Stora Enso has several production sites, switching barriers are also present within the company. When trying to increase interchangeability this is a major obstacle to overcome for Stora Enso. Buschken (2004) speaks about holding customers as economic hostages making it economically impossible for them to switch to another supplier. In this case, it might be so that the customers are locked-in to one production site and do not see any economic gain in qualifying products from another site. For many customers it might be cheaper to turn to competitors and other current suppliers rather than to qualify a new product or a similar product from another site at Stora Enso. However, important to state is that competitors within the industry have the same kind of qualification costs for new products. If it is cheaper for a customer to turn to a competitor it is probably because they have already qualified an alternative product from that competitor.

To conclude, Stora Enso has been able to create some lock-in effects but in their case there are also barriers internally within the company preventing them from being as flexible as they would like. In order to increase interchangeability and successfully move production from one site to another today Stora Enso must have customers closely involved in the process. Facts are that if customers are not satisfied with a new product they might reject and send back orders or even turn to competitors instead.

5.8 Motivating Customers when Increasing Interchangeability

This section will mainly relate to the second research question of how to motivate customers to invest in qualification processes that ultimately lead to increased interchangeability among the production sites. The largest inhibiting factor that was brought up during the interviews with Stora Enso was the qualification costs customers had to invest in a new product. Important to notice is that such a cost is impossible to avoid if a new or existing product is to be developed at another production site. Furthermore, diverged production due to specialization at each site has led to higher switching barriers. The barriers are also present in the form of investment costs, both for Stora Enso and also for its customers when a qualification process is to take place. Therefore, the hard part for Stora Enso is to find the incentives for the customers to invest in such qualification processes. These incentives need to be unfolded in order to answer to the research questions. This will be done by first analyzing B2B relationships then further by analyzing the two historical events at Stora Enso

5.8.1 Motivational Factors in B2B Relationships

As a starting point, the value of having close customer relations must be explored. Stora Enso have customers with different amount of involvement and with which they have different relationships. Regardless of what degree of customer involvement the customers need to qualify the board from a specific board machine in their own machines and in many cases also in the end customers' machines. This implies that the relations, as evaluated above, in this

industry are more complex than a simple buying-selling relation. This supports the theories presented by Ulaga (2003) and Kalwani and Narayandas (1995), that the usage of many suppliers has instead shifted towards having fewer suppliers with closer relations. The benefits of this have been motivated by increasing competitive advantage from both supplier and buyer. For Stora Enso this is important because they compete, as stated before, on quality rather than price.

So why is this interesting in relation to how to motivate customers to initiate a qualification process that increases interchangeability? This is because the degree of closeness to one production site enables customized high quality products and moving products might mean risking a decrease in quality. At least this is what customers might fear according to interviewed persons at Stora Enso. This implies that customer incentives need to be in place not only for economic reasons but also because customers fear they risk the value and quality of the product with increased interchangeability.

Ulaga (2003) presents eight different value drivers of supplier-customer relationships and it is by exploiting them Stora Enso can create incentives for entering a new qualification process. The main two arguments for customers to not accept movement of productions are risks of lowering product quality and investment costs for entering a qualification process. For example, in the article by Ulaga (2003) two of the eighth value drivers of close supplier-customer relationship are identified to be quality and lowered process costs. Therefore, to motivate customers to partake in a qualification process that leads to higher interchangeability Stora Enso needs to improve these values. Not only the ones that are exemplified above but all drivers, presented by Ulaga (2003), that have some relevance for Stora Enso and its customers. Thus, entering a new qualification process means closer relations and more interaction where Stora Enso can highlights the benefits of producing board to a specific customer from more than one production site.

One step further in the discussion of finding which factors that might work as motivators for new qualification processes can be found in Klioutch and Lekers (2011) work where they categorize value drivers into *direct* and *indirect functions.* It is within these two categories the motivators are either by proving short economic benefits or long term values.

5.8.2 Motivational Factors in Historical Events

As concluded in the paragraph above, the importance is to find drivers that serve both economical and long term benefits of increased interchangeability, from the customer's perspective. One way of finding such motivating factors is by analyzing previous events which did or almost did result in a new qualification process and a moving of production. The two cases studied are presented in Chapter 4.

Similar to the situation today where Stora Enso wants to increase interchangeability, when there were gaps in the production schedule at BM5 the initiator was Stora Enso and the company needed to motivate the customer to invest in a qualification process which ultimately led to a new product. Interesting in this case is that Ulagas (2003) first value driver were used as an incentive. As Stora Enso identified the production gap they also identified a need of an improved product for this segment and used that as a motivator for investment from customers. So, creating a closer relation and having more interaction with the customers in this case resulted in motivating customers to invest in a situation that helped Stora Enso with their problems. More general the proceeding would be divided into five-step process, which is shown in Figure 9.

Figure 9: Five-step process of motivating an organization's customers to help an organization to solve a problem

Important to note in this case is that if Stora Enso achieves a quality improvement for a product when produced in another machine this might not lead to improved interchangeability. Instead you only move the production from one site to another without the possibility to switch back, which was also confirmed from interviews with persons at Stora Enso. Thus, to increase the interchangeability quality improvements must be consistent from either machine otherwise the movement will not meet the requirements of increased interchangeability.

The other scenario that came up during interviews was the production stop in 2010, where another motivational factor was used. In this case it was fear among Stora Enso's customers of not being able to receive their orders in time and in turn not be able to supply their customers. This factor is referred to as risk mitigation and it was the biggest and most commonly mentioned motivator during all interviews. The SDM's, SCM's, KAM's, project leader and the supervisor all stated that this should be a possible strong motivator for the

customer. Thus, risk mitigation in this case means that if interchangeability increases, customers decrease the risk of being left without any supplies because if one machine cannot deliver another machine can deliver instead. This can be compared to managing supply chain risks and according to Matook et al. (2009) managing this is a value adding process that ultimately secures profitability for both supplier and customer. One of the SDM's expressed that "the customers see the benefits of interchangeability because then they can always get their deliveries in time"[9] during a discussion about a product currently interchangeable between two different production sites. However, in many cases where there is no interchangeability at the moment the customers handle this type of risk by having several independent suppliers.

As stated in the literature review there are three components that can cause disruption in the supply chain, environmental risks, network-related risk and organizational sources for the disruption (Jüttner et al., 2003). These factors can be causes to disruptive events. The swiss cheese model presented by Shahriari (2011) can be used as a visual tool for motivating customers. If Stora Enso increases the interchangeability another layer of fail-safes will be inserted and the risk of disruption decreases.

The final lesson learned also comes from analyzing at the production stop case. Since the qualification process is a long and costly process the idea of shortening it was born. In the case of the production stop they planned to use old product specifications in order to shorten the process, this means that the qualification process does not need start from scratch every time. Since Stora Enso has moved production between sites before there is probably some old know-how of how to produce products to certain segments and therefore the ability to shorten the qualification process and limit investment cost for Stora Enso and the customers exists. This might not work as an motivator but instead as a tool of making the transition from producing at one site to producing at another more smooth.

5.8.3 Summary of Motivational Factors

To conclude this section about motivational factors it is important to clearly state the factors that can work as motivations. The first factor that will help large organizations in motivating customers is quality improvements that can follow with increased interchangeability. More broadly, quality can stand for any need that the customer have. The second is risk, decreasing risks of failure and disruption in delivering. Third, it is important to show the value of interchangeability for the customer. If it is not a direct economic value, show how it can be profitable in the long run. Worth mentioning is also the impact of the qualification process, by shortening it and lowering the costs for it Stora Enso might experience a less reluctant feeling towards such investments from the customers point of view.

[9] Segment Development Manager 1, interviewed on 2013-03-27

6 Conclusions

This chapter aims to summarize the case description and analysis by answering the research questions stated in the introduction. The chapter starts with a brief recap of the purpose and the research questions and in the end answers to the questions are stated chronologically.

As mentioned in the introduction the purpose of this study was to investigate in what way customer involvement affects interchangeability in well-established organizations. This exploratory study aimed to fill a gap between these two concepts, interchangeability and customer involvement. The single case study at Stora Enso severed as an industry example for fulfilling the purpose. To specify the identified gap and determine exactly what this thesis is meant to examine two research questions were formulated.

1. How does customer involvement affect interchangeability in well-established organizations?

- *What are the implications of switching barriers when increasing interchangeability?*

2. How do well-established organizations motivate their customers to take part in the work with increasing interchangeability?

The first research question is the main question opening up this master thesis and after studying Stora Enso and its historical development the authors can conclude that customer involvement effects interchangeability, both positively and negatively. The road Stora Enso has taken shows that when an organization wants to specialize their product portfolio to gain competitive advantage and create strong know-how it affects the ability to be interchangeable. This is done mainly by unintentionally creating high internal switching barriers for their customers. By having specialized production, e.g. liquid board packaging and product development at one site hampers the transfer of know-how to another production site specialized on another type of board. However, close relationships and a high degree of customer involvement does not necessarily mean a lower ability to be interchangeable, there is no proven contradiction between these two concepts. In order to not reach the situation where a decentralized and specialized organization creates high internal switching barriers it is important to have a focus on interchangeability from the very beginning, meaning that during the new product development phase assure customers and the company that this product can be produced on more than one production site. This leads to the conclusion that more customer involvement can lead to higher interchangeability as long as the focus is on achieving this.

The second research question is directed towards motivational factors for customer to invest, time and money, in increasing the interchangeability. From the case study it can be seen that there is low willingness from the customer to invest in increased interchangeability per say. However, factors that can come from increased interchangeability, such as improved quality, risk mitigation etc., are seen valuable by the customer. Important for the organization in question is therefore to identify needs that its customers want to satisfy and are willing to invest in, and by doing so increase the interchangeability. A key may be closer relationships where NPD and increasing interchangeability work together. From historical events it is shown that improved quality is a strong motivator but important to notice is that the "old" machine needs to produce the same quality product as the "new" one in order for the customer to be satisfied with products from both machines. Another important motivational factor came from the event when the company at one occasion could not deliver board to its customers. If the interchangeability is increased the risk of not being able to deliver is lowered making risk mitigation a motivational factor for the customers. Lastly, in this particular industry, the board industry, it has been shown that the qualification period for testing the board and getting it accepted by the customers is costly and time consuming, both for the board manufacturer and the customer. By reducing the qualification cost and time (the investment barrier), customers can be more easily motivated to enter a new qualification process.

To sum up, the answer to the first question is that customer affects interchangeability negatively if the goal is to specialize and decentralize but customer involvement can have positive effects on the ability to be interchangeable if it is the focus right from the start of the NPD phase. The second question is answered by two major factors that motivate customers, namely, raising the quality of the products and lowering the risk of not receiving an order on time. A third factor that have influence is the time and cost of the qualification process for a new product, if it is shorter and not as expensive customers are more willing to invest.

7 Recommendations

This chapter is divided into two parts, one part with suggestions for further research within this field and one part with recommendations for Stora Enso concerning customer involvement and interchangeability.

For future studies on customer involvement and interchangeability the hope is that this thesis will serve as a base or a first step in filling the identified research gap. The next step is to examine the concepts of interchangeability and customer involvement and their relation to one another in another company or another industry and preferably compare them in order to draw more general conclusions. In the long run, this means trying to develop the research into a theory of how the concepts are related. There is one main weakness of this study and that is that the analyses are mainly based on KAMs' and SDMs' views and knowledge of their customers. Therefore, in a future study it would be of great interest to get first hand views and information from the customers.

The reason for why no customers were interviewed in this study is simply because the company explicitly expressed they did not want the researchers to do so. Instead, Stora Enso suggested that the interviewees should be KAM's and SDM's, whom are the direct link between the customers and the company. For the research, this limitation implies that the facts presented in some cases could be quite subjective and based on the KAM's and SDM's interpretations of the customer opinions. To conclude this discussion, the authors suggest further research which includes direct interviews with customers. By doing so, the hope is that the answers to the research questions will gain higher external validity.

Another area that was left out was the part about how competitors to Stora Enso handle interchangeability problems. If competitors would be studied, conclusions about if the change towards more interchangeable products is industry wide or company specific could be drawn. However due to limited time this was not included in the study and therefore the authors suggest that an industry analysis about this phenomenon should be conducted.

For Stora Enso this study sets a first brick towards increased interchangeability with focus on customer involvement. The next step would be, as discussed in paragraph above, to involve and talk to customers to find out how they actually view upon increased interchangeability and how they would respond to a new qualification process. This is a step that Stora Enso has already initiated to some extent, but it needs to be further investigated in order for the company to reach higher interchangeability. Another recommendation is to dig deeper into the different customer segments (large and small) and what motivates a certain segment to take part in the work for increased interchangeability.

References

Alphonso, O., Ogbuehi, A., Ralph, A. & Bellas, Jr. (1992) Decentralized R&D for Global Product Development: Strategic Implications for the Multinational Corporation. *International Marketing Review, 9(5),* 60-70

Argyres, N., S. & Silverman, B., S. (2004). R&D, organisational structure, and the development of corporate technological knowledge. *Strategic Management Journal, 25,* 929-958

Bernhardt, D., Liu, Q. & Serfes, K. (2007). Product Customization. *European Economic Review, 51,* 1396-1422

Blut, M., Evanschitzky, H., Vogel, V. & Ahlert, D. (2007). Switching Barriers in the Four-Stage Loyalty Model. *Advances in Consumer Research, Vol. 34*, 726-734.

Browne, J., Dubois, D., Rathmill, K., Sethi, S. P. & Stecke, K. E. (1984). Classification of Flexible Manufacturing Systems. *The FMS Magazine, 2*, 114–117.

Bryman, A. & Bell, E. (2011). *Business Research Methods* (3rd ed). New York: Oxford University Press.

Buschken, J. (2004). *Higher Profits Through Customer Lock-In.* Mason, OH: Thomson/South-Western.

Calhoun, C. (2002). *Dictionary of the Social Sciences*. Oxford: Oxford University Press.

Chacar, A., S. & Surysekar, K. (2009). A survey of new product development: Can decentralization alone deliver? *The Review of Business Information Systems, 13(4),* 79-87

Chen, I. J. & Popovich, K. (2003). Understanding customer relationship management (CRM). *Business Process Management Journal, Vol. 9 ,No. 5*, 672-688.

Choi, S-H. & Kim, J-S. (1998). A Study on the Measurement of Comprehensive Flexibility in Manufacturing Systems. *Computers & Industrial Engineering, Vol. 34, No. 1*, 103-118.

Coelli, T., Grifell-Tatjé, E. & Perelman, S. (2002). Capacity utilisation and profitability: A decomposition of short-run profit efficiency. *Int. J. Production Economics, 79*, 261-278.

Colovic, A, & Mayrhofer, U. (2011). Optimizing Location of R&D and Production activities: Trends in Automotive INdustry. *European Planning Studies, 19(8)*

Crook, T. R. & Combs, J. G.(2007). Sources and consequences of bargaining power in supply chains. *Journal of Operations Management, 25*, 546-555.

Dalen, M. (2007). *Intervju som method.* Malmö: Gleerups.

Dorothy, L-B. (1992). Core Capabilities and Core Rigidities: A paradox in Managing New Product Development. *Strategic Management Journal, 13 (special ed.),* 111-125

Du, X., Jiao, J, & Teng, M. (2003). Identifying customer patterns for customization and personalization. *Integrated Manufacturing Systems,* 387-396

Dubois, A. & Gadde, L. E. (2002). Systematic Combining: an abductive approach to case research. *Journal in business research*, *55*, 553-560.

Dul, J. & Hak, T. (2008). *Case Study Methodology in Business Research*. Oxford: Elsevier.

Fornell, C. (1992). A National Customer Satisfaction Barometer: The Swedish Experiment. *Journal of Marketing, Vol. 56 No. 1*, 6-21.

Gupta, D. & Buzacott, J. A. (1989). A Framework for Understanding Flexibility of Manufacturing Systems. *Journal of Manufacturing Systems, Vol. 8, No. 2*, 89-97.

Henrich P., Land M. J. & Gaalman G. J. C. (2007). Semi-interchangeable machines: implications for workload control. *Production Planning & Control: The Management of Operations*, *18:2*, 91-104.

Jones, M., Mothersbaugh, D & Beatty, S. (2000). Switching Barriers and Repurchase Intentions in Services. *Journal of Retailing, Vol. 76(2)*, 259-274.

Jüttner, U., Peck, H. & Christopher, M. (2003). Supply chain risk management: Outlining an agenda for future research. *International Journal of Logistics: Research and Applications, Vol 6 , No 4,* 197-210

Kalwani, M. U. & Narayandas, N. (1995). Long-Term Manufacturer-Supplier Relationships: Do They Pay Off For Supplier Firms?, *Journal Of Marketing , Vol. 59,* 1-16.

Kaulio, M. A. (1998). Customer, consumer and user involvement in product development: A framework and a review of selected methods. *Total Quality Management, 9(1),* 141-149

Ketokivi, M & Ali-Yrkkö, J. (2009). Unbundling R&D and Manufacturing: Postindustrial myth or Economic Reality? *Review of Policy Research, 26(1-2),* 35-54

Klein, R. L. & Long, V. (1973). Capacity Utilization: Concept, Measurement and Recent Estimates, *Brookings Papers on Economic Activity, Vol. 1973, No. 3*, 743-763.

Klioutch, I. & Leker, J. (2011). Supplier involvement in customer new product development: new insights from the suppliers perspective. *International Journal of Innovation Management, Vol. 15, No 1,* 231-248.

Matook, S., Lasch, R. & Tamachke, R. (2009). Supplier development with benchmarking as a part of a comprehensive supplier risk management framework. *International Journal of Operations & Production Management, Vol 29, No 3,* 241-267.

Payne, A. & Frow, P. (2005). A Strategic Framework for Customer Relationship Management. *Journal of Marketing, 69*, 167-176.

Porter, M. E. (1980). *Competitive Strategy*, Free Press, New York, 1980

Reinartz, W., Krafft, M. & Hoyer W.D. (2004), The Customer Relationship Management Process: Its Measurement and Impact on Performance. *Journal of Marketing Research, 41*, 293–305.

Sanna-Randaccio, F. & Veulgelers R. (2007). Multinational knowledge spillovers with decentralized R&D: a game-theoretic aproach. *Journal of International Business Studies, 38,* 47-63

Shahriari, M. (2011) *Loss prevention & Safety: A practical Risk Management Handbook*. Göteborg: Chalmers University of Technology

Tsourveloudis, N. C. & Phillis, Y. A. (1998). Fuzzy Assessment of Machine Flexibility. *IEEE Transactions on Engineering Management, Vol. 45, No. 1*, 78-87.

Ulaga, W. (2003). Capturing value creation in business relationships: A customer perspective. *Industrial Marketing Management, 32,* 677-693.

Vizard, M. (2004). Switching Costs. *CRN, 1101*, 26.

Wahab, M. I. M., Wu, D. & Lee, C-G. (2008). A generic approach to measuring the machine flexibility of manufacturing systems. *European Journal of Operational Research, 186*, 137-149.

Watts, B. F. (2009). *Engineering Documentation Control Handbook* (3rd ed.), *Interchangeability* (pp. 73-91). New York: William Andrew Inc.

Winer, R. (2001). A Framework for Customer Relationship Management. *California Management Review, Vol. 43, No 4*, 89-105.

Youn Kim, H. (1999). Economic Capacity Utilization and its Determinants: Theory and Evidence. *Review of Industrial Organizations, 15,* 321-339.

Zammori, F., Braglia, M. & Frosolini, M. (2011). A measurement method of routing flexibility in manufacturing systems. *International Journal of Industrial Engineering Computations, 2*, 593-616.