

Supply Chain Optimization

-for Sourced Production

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Abstract

- Title:** Supply Chain Optimization – for Sourced Production
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- Issue:** To source components from China is less expensive than setting up and running an own plant in any western country, but sourcing from low cost countries is related to challenges regarding business culture, logistics, quality and supply chain management. Cultural differences can make operations run less smoothly and the number of warehouses and transports need to be investigated. Communication processes must be reengineered or established, quality controls become a factor of utmost significance and the management of the entire supply chain needs to be intensified.
- Purpose:** The purpose of this thesis is to investigate and propose a method for how supply chain optimization for sourced production could be addressed. To achieve practical relevance a case study is performed of Lilleborg and their sourcing of components from China.
- Method:** An inductive approach has been applied when conducting the study. The work process has been iterative and empirical qualitative data has been gathered through semi-structured interviews and literature studies.
- Conclusion:** By applying a framework that consists of empirics and several relevant theories that form a cohesive and coherent tower towards set of objectives is the appropriate strategic behavior for optimizing a supply chain according to this study.
- Key words:** Sourced Production, Tower of Theory, Chinese Business Culture, Logistics, Warehouse, Communication, Transport, Quality, Quality Controls and Supply Chain Management.

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1. Introduction

This chapter focuses on giving the reader an understanding of why this thesis is of practical and academical relevance. The present situation is described and relevant problems are explained and discussed. Further is the purpose of this thesis defined, necessary delimitations are presented and definitions are given to enhance the understanding of thesis and theoretical framework. Finally an outline of the thesis is presented to give the reader an overview of the study as well as the contents in each chapter.

1.1 Background

Outsourcing and sourcing of non-core competencies will continue to increase¹ and China is the country that many companies decide to outsource their production to. China's sourcing market is growing approximately 30 percent annually² and many foreign companies find the possibility of cutting production costs by leveraging the country's cheap labour base³. Outsourcing and sourcing to China as a mean to cut production costs is a cumulative trend and an issue that has been studied in a number of books and articles. But not all costs are lower in China, the percentage of logistics costs in GDP e.g. is much higher in China compared to developed countries such as Western Europe and United States⁴. Western countries source production to cut costs but on the other hand they will have to pay a high price for inefficient logistics when transporting the goods from the local manufacturer in China. Not only is sourcing to China connected with relatively higher logistics costs even deteriorate product quality is most often linked to sourcing. To establish a developed and working quality control system is often a problem⁵ and the consequences might be higher rates of rejection, repackaging, scrap and rework, and lost sales due to out-of-stocks and slow turns⁶.

Logistics and quality are not the only problem areas when sourcing from China, attention must also be paid to the Chinese business culture. When engaging and maintaining business relations with a Chinese partner it will be impossible to succeed if not taking into account Chinese culture and their way of doing business.⁷

¹ <http://www.industryweek.com/ReadArticle.aspx?ArticleID=13312,20080314>

² <http://www.slideshare.net/randomwire/china-101-facts-trends-opportunities,20080317>

³ Cole Ollinger

⁴ Wang (2006)

⁵ Nassimbeni & Sartor (2006)

⁶ Cole Ollinger

⁷ Helgesson

Outsourcing and sourcing is a way for companies to cut production costs but inefficient logistics, quality problems and different business culture are factors that increase the need for efficient communication and sufficient management of the supply chain to improve the companies' overall performance. There has been found little evidence of an investigation on how to consider business culture, logistics, quality and supply chain management when sourcing from China. Hence the issue on how to optimize the supply chain when sourcing from China is of both practical and academical importance.

A company that has been experiencing the problems mentioned above when sourcing from China is Lilleborg, Norway's largest manufacturer and marketer of branded consumer goods within home and personal care. The company is a part of Orkla Brands and the only one of its type in Norway to run the entire value chain itself, including product development, production, sales and marketing. The product portfolio includes a wide range of well-known brands, most of which are market leaders in their segments.

Lilleborg is offering premium products with good margins and as a mean to be able to maintain good margins in a very price sensitive market the company has started to source various plastic components from China. Non-complex plastic components such as caps etc. are less expensive to source from China than Europe mainly due to much lower wage rates⁸.

A handful local manufacturers, situated within 200 km radius from Shanghai harbor, are producing the plastic components that later are being shipped to Norway. After repacking in Oslo the components go by truck to one of Lilleborg's plant, Ello, in Kristiansund. Ello, a single entity, source numerous components from different sourced manufacturers in China and the structure of the transportation system is the same, see Figure 1, regardless of manufacturer.

⁸ Cole Ollinger

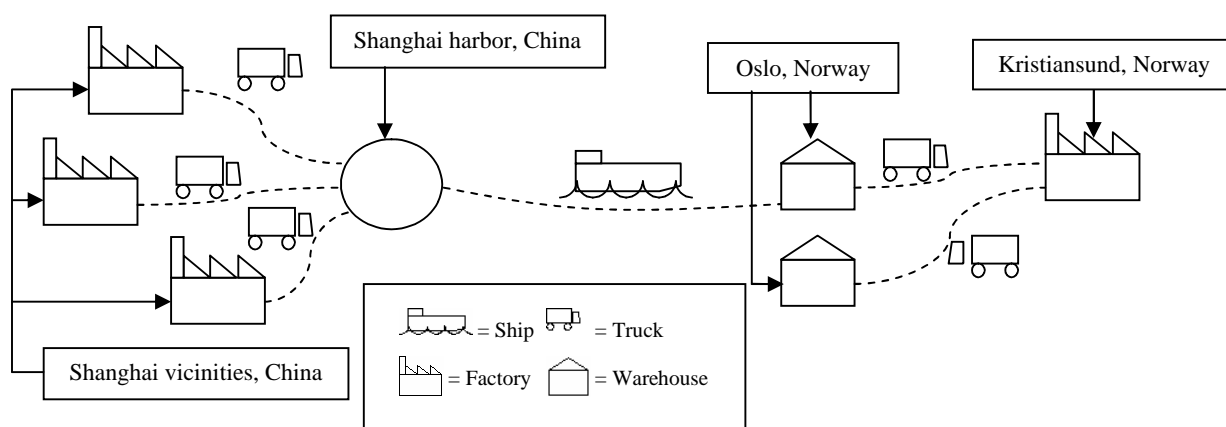


Figure 1: Context of research question presented via the case study of Lilleborg

1.2 Problem Discussion

To source components from China is as earlier mentioned less expensive, mainly due to lower labor costs, than running an own domestic plant in western countries. But sourcing from China is unfortunately also connected with some non-favorable consequences within the supply chain.

There are evidences of misunderstandings between China and Norway. Frustration and lack of information have been issues concerning this somewhat new process at Lilleborg. There is inadequate information on what is causing these issues to exist due to the fact that there is no previous investigation of the activities concerning the supply chain for sourced production in China.

Logistics, i.e. warehouse, communication and transports are some areas that at first glance have been regarded as possible areas of improvement. E.g. there is signs that suggest a new establishment of a warehouse in Shanghai should enhance performance.

Problems that have emerged sometimes concern inadequate quality of components. Since current quality control activities at Lilleborg does not support a process of sourcing components from China this area presents a significant area of interest. Several questions arise from this, e.g. is current quality control activities performed in an appropriate way or even more important, are the quality deficiencies the result of other malfunctioning processes.

Concluding comments are that the process of supply chain optimization for the sourced production in China has not satisfactorily prioritized and investigated. There is a need of mapping the activities, analyzing different areas of concern and recommend possible actions to perform.

1.3 Purpose

The purpose of this thesis is to investigate and propose a method for how supply chain optimization for sourced production could be addressed. To achieve practical relevance a case study is performed of Lilleborg and their sourcing of components from China.

1.4 Delimitations

Geographical delimitations of the thesis concern sourcing in China and in particular Shanghai vicinities. When referring to western countries the case of Norway and the production in Kristiansund is used and seen as an adequate representative. Perimeters of supply chain investigations are the warehouse in Oslo and the sourced production facilities in China, variables of perimeter areas are considered fixed in most cases. Due to Lilleborg's desire, the actual production processes at Kristiansund will not be investigated. Chinese laws and regulations are not investigated in the thesis, if needed Lilleborg will use internal expertise when considering the impact of laws and regulations on the provided recommendations.

1.5 Definitions

Culture: *"The society that people grow up in shapes their basic beliefs, values, and norms. People absorb, almost unconsciously, a world view that defines their relationship to themselves, to others, to nature, and to the universe."*⁹

Logistics and Logistics Management: *"Logistics management is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements."*¹⁰

Quality: *"The quality of a product or service is its capability of satisfying the customers' needs and expectation"*¹¹

Supply Chain Management: *"Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply*

⁹ Kotler (1991)

¹⁰ <http://cscmp.org/aboutcscmp/definitions/definitions.asp>, 20080321

¹¹ Nationalencyklopedin (1993) b. 11 p. 560

*chain management integrates supply and demand management within and across companies."*¹²

Sourcing: Sourcing is the purchasing of a product, service or process from an external source that previously were performed within the own organization.¹³

Outsourcing: Outsourcing is when an organization sells a facility, part or subsidiary and as collateral agrees on purchasing of product, service or process from the facility, part or subsidiary in mind.¹⁴

1.6 Target Audience

The thesis' primary audience is professionals and academics with interest in sourced production and supply chain consequences with sourced production. Professionals at Lilleborg and academics within the areas of supply chain management, logistics and quality will also find this thesis of relevance. Secondary audience is other professionals and academics with interests in Chinese business culture, sourced production processes and communication.

1.7 Outline

A brief outline of the thesis is presented to give the reader an overview of the study as well as the contents in each chapter. After the introduction provided in this chapter, the methodological framework used within the work process to conduct the study and to meet the purpose of this thesis is described and discussed. The theoretical framework is described in chapter 3 and the different relevant theories and models are explained and so is the interdependent combination of them. Chapter 4 shows all gathered empirics of relevance for generating recommendations on how to optimize supply chain for sourced production and the analysis considering gathered empirics and theoretical framework is presented in chapter 5. The different recommendations are discussed and presented in chapter 6 and final conclusions are provided in chapter 7.

¹² <http://cscmp.org/aboutcscmp/definitions/definitions.asp>, 20080321

¹³ Robert Lindroth, 20080317

¹⁴ Robert Lindroth, 20080317

2. Methodology

In this chapter the methodology used to meet the purpose of this thesis is discussed. To create an understanding of the entire process the work process is described and the various methodological choices made, are presented. Further is the reliability and validity in the chosen methodology analysed and as well the impact of relevant paradigms.

2.1 The Three Nodes of Research

To be able to conduct the research in the best possible way and increase the accumulated body of knowledge within a specific area, it is critical to be aware of the importance of the fit between the three nodes of research, see Figure 2. The three nodes of research are:¹⁵

- The problem, i.e. the purpose of the research
- The methodology which consists of various tools, methods and devices to conduct the study and to meet its purpose.
- The paradigm, e.g. basic assumptions of reality and knowledge from the researcher's point of view.

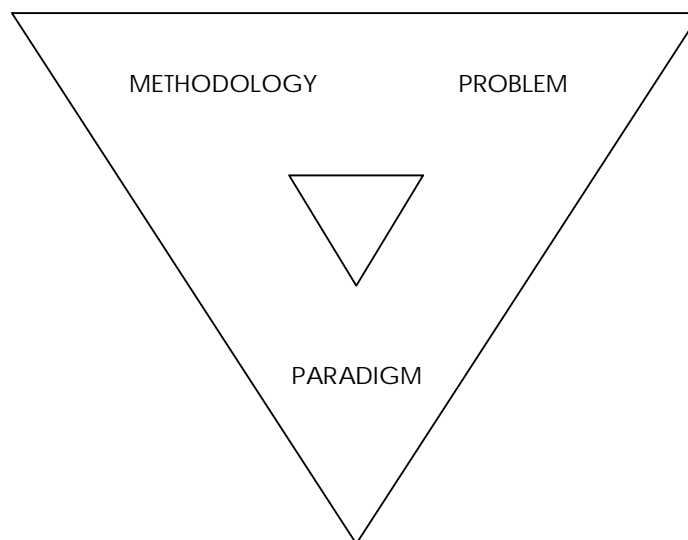


Figure 2: Three nodes of research, Nilsson (1995) p. 36

¹⁵ Nilsson (1995) p.36

2.2 Methodology and the Problem

In this research the problem was first identified and briefly investigated before any methodological choices were made and the current methodology was chosen. This way of working, to choose the most suitable methodology to answer the research question, may be advantageous for this specific study as well as for the collective creation of knowledge in general.¹⁶

2.3 Methodology and the Paradigm

Methodology can be seen as a tool to map reality, either objectively or subjectively depending on which paradigms the researcher chooses to adapt.¹⁷ In this thesis a number of opposing paradigms have influenced the various methodological decisions e.g. the way of analyzing gathered empirics and generate concepts and recommendations.

Positivism and **interpretivism** are two opposing paradigms that together describe some of the basic assumptions in this thesis. From the doctrine of positivism the following view is applied; knowledge is arrived through gathering of empirics and the facts can provide the basis for laws¹⁸. With this said the results of the study conducted in this thesis can be relevant for other organizations under similar circumstances, e.g. findings from the case study focusing on one organization can be applied on other organizations with the same basic conditions. On the other hand awareness of some of the aspects supported by interpretivism is critical to take into consideration, e.g. the fact that people view reality in different ways because of personal emotions, different backgrounds etc¹⁹. This aspect affects the analyzing of gathered empirics and the generation of concepts. A philosopher named Karl Popper believed that the two paradigms could be combined and emphasized that even social systems surrender to certain laws, these laws however are not as absolute as in natural science. By this statement he contradicted the doctrine of positivism, the belief that social systems follow fixed laws, and the doctrine of interpretivism, every observation is unique. His and many other scholars' view of the combination of the two paradigms has created the term **inter-subjectivity**, a term that can be seen as a relevant paradigm for this thesis.²⁰

Other paradigms that have shaped the authors' view of science are some parts of **the analytical paradigm**, a paradigm closely related to positivism, and **the system paradigm**. The first paradigm states that theories can be created from original

¹⁶ Nilsson (1995) p.39

¹⁷ Jacobsen (2002) p.34

¹⁸ Bryman & Bell (2003) p.14

¹⁹ Jacobsen (2002) p.32

²⁰ Jacobsen (2002) p.40

observations and that general laws can be concluded from individual cases. From the second paradigm the belief that the whole differs from the sum of the parts, i.e. called synergies, is found relevant.²¹ The two paradigms are relevant due to the fact that the thesis focuses on a case and combining quality and logistics to achieve synergies.

2.4 Methodology and the Process

2.4.1 Work Process

Roughly the process is divided into two loops, see Figure 3. Empirical material is gathered, theory is studied and analysis is performed twice, primarily to ensure accuracy of conclusions and reduce risk of information gaps. The first loop focused on mapping and understanding the current situation, e.g. the logistics between the facility in Kristiansund and the manufacturers in Shanghai. The objective in the first loop was to analyze empirics with theory on how to improve logistics and quality control. By using the theoretical framework, see chapter 3, in combination with gathered empirics, see chapter 4. In the second loop more thorough work on recommendations was performed founded in the results of the first loop. Empirical and theoretical contribution at this point concerned mainly specific details which might affect suggested recommendations.

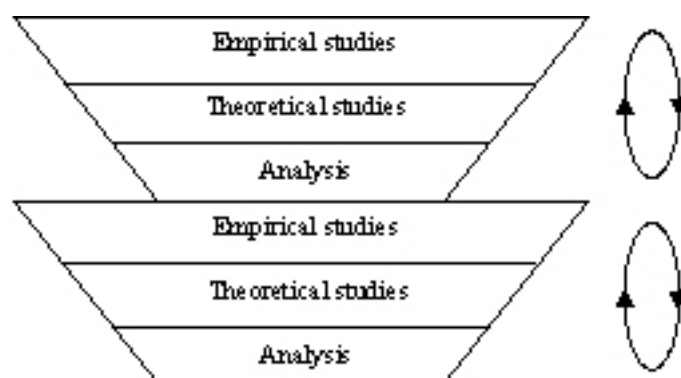


Figure 3: The double loop work process of this thesis

2.4.2 Inductive Approach

In this thesis an inductive approach was applied when conducting the study. The approach is suitable for drawing generalizable inferences out of observations and the process is iterative; it involves a weaving back and forth between data and theory.²² Considering the nature of the research question and the authors' lack of knowledge about the relevant context, an inductive method e.g. supported by the analytical paradigm, is adequate. In the working process, mentioned above, the

²¹ Bjerke (1981) p.5-9

²² Bryman & Bell (2003) p.12

work is divided into two loops where gathering of empirics and theory generation can be seen as an iterative process.

The inductive approach and the iterative process can be seen at the right side in Figure 4. The right side of the cycle visualizes the inductive method and the chosen approach for this thesis in a sufficient way.²³

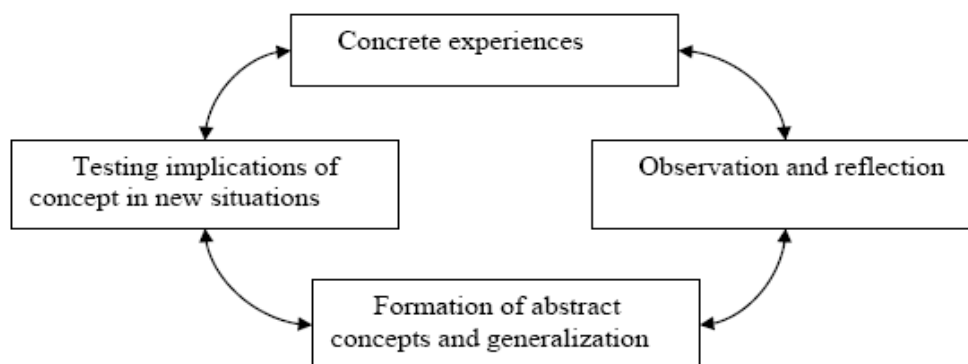


Figure 4: Kolb's Experimental Learning Cycle, Kolb et al. (1979)

2.4.3 Qualitative Method

The inductive approach chosen in this study predominantly emphasizes gathering of qualitative empirics²⁴. Qualitative data is gathered when the objective is to achieve a more thorough understanding of complex problems²⁵ and when there e.g. is a lack of background knowledge²⁶, as in this case.

By gathering qualitative information, words, instead of quantitative data, numbers, greater flexibility is achieved and more nuanced and open answers were given by chosen respondents. A qualitative method supports the iterative process in the inductive approach and this is desirable since the outcome of the two loops in the work process not by any means can be regarded as fixed. When gathering qualitative data detailed information can be received by asking just a few respondents whereas you have to get many answers from many respondents to get the same information when gathering quantitative data. On the other hand a quantitative method simplifies the ability to draw general conclusions from gathered empirics which enhance reliability.²⁷

²³ Kolb et al (1979)

²⁴ Bryman & Bell (2003) p.25

²⁵ Andersen (1998) p. 31

²⁶ Jacobsen (2002) p.142

²⁷ Jacobsen (2002) p.142

2.4.4 Data Collection

The data gathered in this thesis can primarily be divided into two different categories, primary sources and secondary sources. Data gathered by the researchers themselves is seen as a primary source while data collected by someone else, e.g. other scholars, institutions etc. is seen as data from a secondary source.²⁸

In this thesis the primary source of information is the raw material that has been gathered through conducted interviews with relevant respondents at Lilleborg and other experts. These experts were chosen from areas in which additional information was required and of significance for the outcome of the thesis. Secondary sources used in the thesis were mainly published articles, various documents and reports, facts and figures and other literature that specializes on the subject, e.g. logistics, quality etc.

2.4.4.1 Primary Sources

To be able to meet the purpose of this thesis, i.e. to investigate and propose how supply chain optimization for sourced production should be addressed, it is critical to get access to information about problems and challenges that de facto occur in this situation. The use of an authentic company, Lilleborg, can be seen as a mean to obtain a primary source of information, hence was a **case study** conducted to meet the purpose of this thesis. Case studies can be seen as an effective and suitable way to get hold of needed information when applying an inductive approach²⁹, as in this thesis.

The information was gathered through qualitative **semi-structured interviews**. Qualitative interviews were conducted in this thesis since they are associated with great flexibility and rich detailed answers³⁰. By choosing semi-structured interviews the interviewer has a series of questions that are in the general form of an interview guide but the questions may not follow exactly on the way outlined in the schedule. Also, the interviewer usually has some altitude to ask further questions in response to significant replies.³¹ An email explaining the structure of the interview and a list of some of the relevant interview questions was sent in advance to the respondent. By this the respondent had time to find the needed information, inform if the questions better could be answered by someone else and any misunderstandings or inquires regarding the interview, questions etc. could be sorted out in advance.

Interviews have been held **face-to-face** when possible, otherwise over the telephone or by e-mail. To meet the respondents individually and in person enhance quality of

²⁸ Andersen (1998) p.150

²⁹ Jacobsen (2002) p.97-98

³⁰ Bryman & Bell (2003) p.343

³¹ Bryman & Bell (2003) p.119

gathered empirics since people tend to be more honest and open when answering questions face-to-face. Furthermore can the interviewer observe gestures and body language, which might give relevant information.³² On the other hand, telephone interviews are less expensive than personal interviews and much easier to supervise. Another advantage is that the interviewer cannot affect the respondent to answer certain questions in a biased way since the interviewer's characteristics cannot be seen.³³

In order not to forget valuable and important information from the conducted interviews, one researcher was in charge of the interview e.g. asking the majority of the questions etc. and the other researcher focused on making a **transcript** on what was being said, moods, gestures and so forth. After each interview the transcript of the interview was discussed by the two researchers and comments and corrections were made. Otherwise the reliability and validity of the interview might have been affected. When conducting qualitative interviews it is almost unfeasible to present all gathered information in the thesis but it is however of utmost importance that all relevant data is presented because otherwise reliability might be insufficient³⁴.

The objective with the interviews was to gather relevant data needed to investigate and answer the research question mentioned in chapter 1.3. To be able to do this, needed empirics was divided into a number of categories, questions were formulated and a number of interview guides were created. The needed data was divided into following eight categories; **Sourced production in China, Inland logistics in China, Warehouse in Shanghai, Quality, Shipping, Norwegian production site, Communication and Administration in China**. After gathering of the relevant data the previous eight categories were substituted by the following four; **Business Culture, Logistics, Quality and Supply Chain Management**. The four categories summarize the gathered empirics in an accurate and adequate way.

Respondents were selected after the identification of the relevant areas for empirical gathering, see Appendix 1, and individual and unique interview guides were created for each and every respondent. To guarantee that the gathered empirics cover all relevant problems and situations interviews with external experts have been conducted in addition to a number of interviews with people associated with Lilleborg. Following respondents have been selected;

Business Developer Lilleborg, Jan Eskil Hollen, responsible for Lilleborg's business development in Asia.

³² Jacobsen (2002) p.161

³³ Bryman & Bell (2003) p.120

³⁴ Nyberg (2000)

CEO Lilleborg, Arve Heltne, CEO at Lilleborg.

Logistics Lilleborg, Paulina Larsson, in charge of warehouse and inbound and outbound logistics at Lilleborg.

Packaging Lilleborg, Bjorn Heggdal, manager for packaging development at Lilleborg.

Quality Control Lilleborg, Christine Steiro, manager for Quality Control at Lilleborg.

Sourcing Director Lilleborg, Atle Berg, responsible for procurement and logistics of sourced productions at Lilleborg.

Procurement Kristiansund, Eivind Haukenes, in charge of procurement at the site in Kristiansund.

Quality Control Kristiansund, Anne Lise Brevik, responsible for quality control at the site in Kristiansund.

Technical Officer Kristiansund, Johan Knudsen, technical officer and responsible for technical improvements at the production site in Kristiansund.

Procurement Shanghai, Long Sheng Huang, one out of three employees responsible for procurement, quality control etc. at Lilleborg's office in Shanghai.

Chief Representative Shanghai, David Chan, in charge of Borregard China which serves as a platform to serve Orkla related subsidiaries.

Experts;

Marie Lange has more than 20 years of quality related experience. Marie has been quality manager at Gambro, Nolato and is currently responsible for the overall quality at AtosMedical and eight of its subsidiaries. Marie has great experience related to sourced production and many of their suppliers are situated in China.

Robert Lindroth has been working as a consultant within logistics and supply chain management for several years but is currently writing his doctorate in Engineering Logistics at Lund Technical University (LTH). Robert's research is focused on Supply Chain Risk Management, i.e. how can strategic uncertainties and risks regarding e.g. capacity investments be handled in a supply chain context.

Charlotta Johnsson has got a PhD in Automatic Control and a M. Sc. in Electrical Engineering. Charlotta is working as a research assistant and lector at the Department of Automatic Control at LTH. Her research focuses on Batch Control,

Manufacturing Operations Systems, Interoperability: Business Systems and Manufacturing Operations Systems and Graphical Languages for Supervisory Sequential Control.

Knud Midtgaard is Vice President Operations at Alfa Laval and responsible for strategy making and overall logistics. Knud has been working as a manager for Logistics for almost 20 years. Before he started working for Alfa Laval he was manager for the logistics at a Danish company called Numeco.

2.4.4.2 Secondary Sources

The main method for gathering relevant information has been through literature studies where books and articles have provided relevant information about the area of study in general and the theoretical framework in particular. Deepened knowledge about many of the theories used in the theoretical framework have been achieved by studying academic books from the library and by reading articles found in the university's database.

Documents and leaflets with photos and basic information about China and Shanghai have been studied to achieve satisfactory background history and local knowledge since no visit in China or Shanghai has been made. Moreover have reports and facts and figures from Lilleborg provided a great insight to the organisation and given highly relevant empirical input when mapping context and generating concepts.

2.4.5 Overall Validity

All methodological choices made in this thesis have affected validity and reliability in one way or another. To be aware of the risks associated with some of the methodological choices is critical but even though awareness is obtained it might not be enough to sustain high validity and reliability. The overall validity in this thesis can be discussed on the basis of three relevant parameters, see figure 5³⁵.

Reliability:

- ❖ Are the results of the study repeatable?

Internal validity:

- ❖ Have we measured what we wanted to measure?
- ❖ Do we have a good foundation for our conclusions?

External validity:

- ❖ To what degree can we generalize our conclusions?

Overall validity

Figure 5. The basic elements of overall validity, Jacobsen (2002) p. 473

³⁵ Jacobsen (2002) p.473

2.4.5.1 Reliability

Reliability is a measure on how the chosen and conducted methodology and analysis have affected the results and whether the results would have been the same at different times but under the same circumstances.³⁶

Since interviews are conducted to collect people's opinions, reliability is difficult to control. A person's opinion can be affected by external factors and by the interviewer. By carefully creating non-leading questions and paying attention to the risks associated with conducting interviews reliability related issues in this study have been minimized. To send a respondent an e-mail with the relevant questions beforehand reduced the risk of misunderstandings and by having one researcher in charge of the interview and the other focusing on making a transcript the risk of missing relevant data could be reduced. By making a transcript and by discussing the gathered data the risk of misinterpretations could be more or less eliminated.

2.4.5.2 Internal Validity

Internal validity is dependent on two central conditions, the ability to de facto examine what is supposed to be examined and the ability to interpret the gathered empirics objectively and correctly.³⁷

In this study the methodology has been carefully chosen, a number of alternative ways have been discussed and analyzed before the final methodology was selected. The chance of de facto examine what was supposed to be examined have been improved by applying the most adequate methodological approach for setting the theoretical framework, gather empirics and finally conduct an analysis and generate relevant recommendations.

By conducting interviews with at least two respondents within each area, see Appendix 1, as well as external experts the risk of not noticing subjectivity in gathered empirics was reduced. To make transcripts, discuss data and findings as well as consulting external experts the ability to objectively and correctly interpret gathered empirics is sufficient.

2.4.5.3 External Validity

External validity is about whether general conclusions can be drawn from the study and how certain and accurate these general conclusions would have been.³⁸

³⁶ Jacobsen (2002) p.472

³⁷ Jacobsen (2002) p.473

³⁸ Jacobsen (2002) p.473

The study focuses on one particular case and situation but this particular situation is not unique and nor is the context. From the study general conclusions can be made due to the high level of applicability. Theoretical contribution is given by using several different theories in a coherent and cohesive way, a way that can be seen as a general tool for supply chain optimization for sourced production.

3. Theoretical Framework

In this chapter the theoretical contribution of this thesis is presented and discussed. A methodological framework of how to address issues that are both theoretical and practical are formed. The different theories constituting the theoretical framework are introduced and described, further are criticism of the process and the contributing parts discussed.

When theory and practice merges with the aim of both enhancing the theoretical landscape and solving the practical problem at hand, the use of several theories are inevitable. Challenges emerge not alone with the adaptation of theories to a practical problem but also from, how to achieve synergetic results from different areas of research. To ease approach and understanding of the process the following illustrative explanations of connectivity are often used, see Figure 6.³⁹

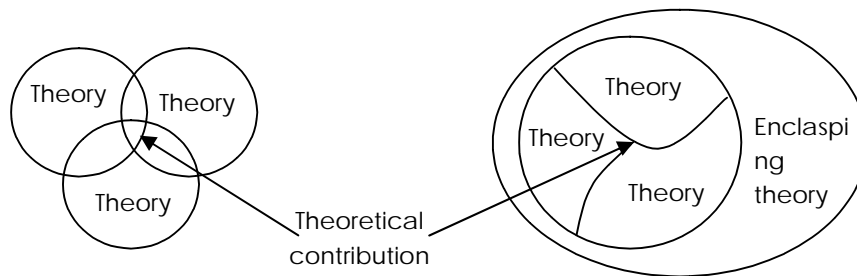


Figure 6: Venn diagram and a similar figure which states relations between different classes e.g. theories, Nationalencyklopedin b.19 p.350.

The Venn diagram and similar illustrative explanations are however insufficient when addressing practical problems with theories. This since theories seldom contributes to a solution in the same way and they are always dependent on each other. Furthermore, the practical problems are often too complex to address without a defined process, the Venn diagram does not provide any guidelines of procedure.

Applied disciplines, such as Management and Information Technology, almost always have both a strong theory component and a strong practice component. Nevertheless, applied disciplines focuses mainly on making significant advancements in articulating the theoretical foundation of their fields of study and the discussion and research is often neglecting both integration and interpretation. Not only is the research not encouraging integration and interpretation, the practical component is also most often overlooked.⁴⁰

³⁹ Nationalencyklopedin b.19 p.350

⁴⁰ Swanson Richard

In this study it is found critical to focus on the theory component and the practical component as well as the importance of interpretation and integration of theory and practice. Hence a new methodological framework, the tower of theory, has been developed and applied in this study.

3.1 Tower of Theory

The tower of theory is a metaphorical model of the process and the result of a theoretical contribution in the context of a practical problem. This clarification is presented due to the shortcomings of existing explanations. The process is described as the construction of a tower, the aim of both enhancing the theoretical landscape and solving a practical problem is merged and represented by the mark of height for the tower.

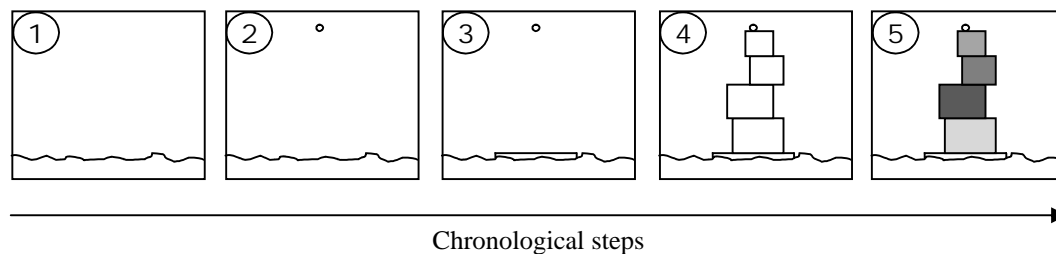


Figure 7: Tower of theory - An illustration of the thought process

3.1.1 The Ground – picture 1 in Figure 7

The first issue to address is the context of the practical problem. This represent the ground, the building site for the tower. Different complexity of context and the external environment creates different appearances of the ground, e.g. complex context imply rough ground hence it is more difficult to construct the tower, see picture 1 in Figure 7.

3.1.2 The Mark of Height – picture 2 in Figure 7

From the context, the expected theoretical contribution and the practical issue at hand a single mark of height for the tower is formed. The mark of height represents all these objectives and show which point to reach when constructing the tower, see picture 2 in Figure 7.

3.1.3 The Foundation – picture 3 in Figure 7

As stated in the introduction to chapter 3 different theories affect the solving of the problem in different ways. There are theories that are vital to the reaching of objectives but seldom contribute with synergetic effects when combined with other theories. These theories do not affect the other theories but rather makes the context easier to understand. These represent the foundation, see picture 3 in Figure 7.

3.1.4 The Framework – picture 4 in Figure 7

To create a proper framework of theories several aspects have to be considered. What theories, to which extent and in what order they should be addressed to reach identified mark of height. For an optimal process, identify the theory of most importance and adapt it to the ground and foundation. Continue addressing theories until mark of height is reached. It is of utmost importance to adapt the next building block of theory to the already existing tower. The better the different contributions fit, the sturdier the construction will be and a more profound theoretical contribution is created. An important notice when approaching theoretical contribution in an iterative way is to consider all parts every time a change occur, modifying one building block will affect the sturdiness of the entire tower, see picture 4 in Figure 7.

3.1.5 The Structure – picture 5 in Figure 7

To solve the practical case at hand the theoretical framework has to be filled with relevant empirics, the structure. Further, analyzing the empirics in aspect of the theories will result in applicable conclusions and finally this will provide enough insight for relevant recommendations to be made, see picture 5 in Figure 7.

3.2 Tower of Theory in Practice

The five steps that together constitute the tower of theory, see chapter 3.1, are to be seen as a framework for the conduction of this thesis. Step 1 and 2 have been conducted in previous chapters, where the ground was identified and set in chapter 1.4, the mark of height was discussed in chapter 1.3. The delimitations set for this thesis form the ground and the formulated purpose is the mark of height. In this thesis the overall purpose stated in chapter 1.3 is the objective but when applying the tower of theory the overall purpose is divided into three sub-objectives, cost efficiency, improvement of processes and quality enhancements.

Step 1 and 2 are as earlier mentioned discussed in previous chapters and step 3 and 4, see Figure 8, are mainly conducted in chapter 3.3, but all of the following theory chapters are to some extent relevant since the foundation and the framework is built on the theories that are presented in this chapter. By identifying and selecting adequate theories and combining these, a foundation of a relevant theory can be laid and the passable theoretical framework for this study can be built.

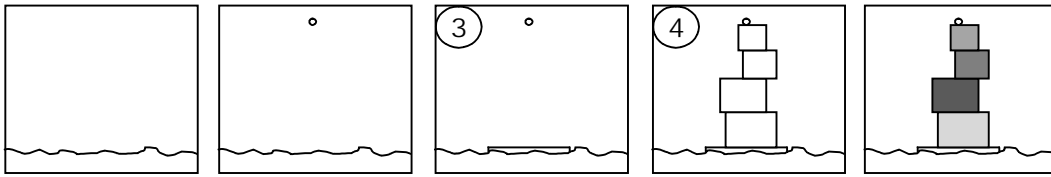


Figure 8. The two steps conducted in this chapter, own development

The final step, the structure, is addressed in chapter 4, 5 and 6. The fifth and final step is conducted when gathering empirics that can be put into the different theoretical boxes in the framework in chapter 4 and further in the analysis in chapter 5 where each theoretical box and its empirical content is discussed and analyzed. To complete the process relevant recommendations are presented in chapter 6.

3.3 Theory: Supply Chain Optimization for Sourced Production

To meet the purpose of this thesis the following tower was constructed.

The roughness of the ground needed to be smoothed out; one major factor was the location of the sourced production.⁴¹ When a western company source from China the cultural differences of doing business are important to address.⁴² With the consideration of Chinese way of negotiating and trading a foundation for the tower was constructed.

With the foundation of Chinese business culture and the context of the problem discussion, the purpose and expected results as the mark of height for the tower, the proper theories had to be identified. According to Guido Nassimbeni and Marco Sartor there are five areas of expected interventions when a western company has established an agreement with a Chinese manufacturer.⁴³

- Information systems
- Logistics
- Purchasing
- Quality
- Production and technology

These five areas are to be considered in the general case. When comparing the suggested areas of research with context, delimitations and purpose of this thesis

⁴¹ Arnell et. al. (2006)

⁴² Nassimbeni et al. (2006) p. 33

⁴³ Nassimbeni et al. (2006) p. 94

it became evident that the theoretical contribution in this thesis was based on Logistics and Quality. However, to reach the purpose an addition of some supply chain management theories were needed. Information systems and Purchasing is to some extent covered via the theory of Logistics. Production and Technology is discarded in this thesis since they are seen as fixed parameters, see chapter 1.4.

When approaching the two main theoretical contributions, logistics and quality, logistics was identified as the most suitable to begin with, this due to the interdependence between the two areas. Logistics does address aspects of quality⁴⁴ and with the logistics area mapped, a more relevant study and discussion of quality could be performed.

With the reason from chapter 3.2 and 3.3 in mind the following theories were addressed; Business Culture, Logistics, Quality and Supply Chain Management.

3.4 Business Culture

Helgesson stated the following concerning culture.

*"It is one of the words that everyone says they understand if you ask them, but it is still difficult to explain the meaning of it."*⁴⁵

Kotler described culture as:

*"The society that people grow up in shapes their basic beliefs, values, and norms. People absorb, almost unconsciously, a world view that defines their relationship to themselves, to others, to nature, and to the universe"*⁴⁶

In every social relation an understanding of culture and cultural differences is vital, this include business relations. When engaging business relations between actors with different histories and background the main difficulties are often ascribed to the cultural gap.⁴⁷

3.4.1 General Culture

Addressing cultural issues in business relations is a matter of preparations, research and understanding. Hofstede is seen as one of the pioneers within the area of cultural studies. In 1984 he presented the four most significant dimensions that define different cultures.⁴⁸

⁴⁴ Van Weele (2005) p. 191

⁴⁵ Helgesson (1996) p. 9

⁴⁶ Kotler (1991)

⁴⁷ Nassimbeni et al. (2006) p. 33

⁴⁸ Helgesson (1996) p. 84

- **Power distance.** It is how "close" individuals at lower positions feel to the ones in higher position, when discussing organizational structures.
- **Uncertainty avoidance.** To what degree the members of a culture feel secure with uncertainty and ambiguity.
- **Individualism.** Do members put themselves in front or the community?
- **Masculinity.** Which style is preferred, achievement or relationship?

Although some elements of Hofstede's research could be viewed as old fashioned it is a useful tool not only to categorize different cultures but to understand them. The four dimensions could answer what the most important issues and differences of concern when engaging a cross-cultural business relation.

Helgesson divides the possible problems of cultural differences when visiting other cultures in two categories.

Type 1 problem. This is when you perceive an action or behavior as "strange" or unexpected by another actor.

Type 2 problem. This is when you behave or act in a way that is seen as "strange" or unexpected by another actor.

These two categories are a simple but a clear separation of incidents that could prove effective to have in mind when interacting in business relations.

An understanding of the existence of cultural differences and that "your" way is not always the appropriate way or even the best way is a first step. It is always important to realize that a perfect match and a perfect relation are unusual, but an imperfect relation can still be a good functional relation. To handle problems and further enhance the possibilities of a profitable business relation the following statements should be considered. The list below is drawn from Helgesson's conclusions on how to handle problems of cultural differences.⁴⁹

- Learn that everyone is not like you.
- Observe others but most important observe yourself.
- Achieve basic cultural knowledge.
- The same action may have different meanings in different situations.
- You always make mistakes, try to make small mistakes.

⁴⁹ Helgesson (1996) p. 23

- *"When in Rome do as the Romans do."*

3.4.2 Chinese Culture

The reasons stated in chapter 3.4.1 form a framework applicable to different cultures. Considering the situation of an Asian country, in this case China, the framework should be filled with certain characteristics. When engaging and maintaining business relations with a Chinese partner it will be impossible to succeed if not taking into account Chinese culture and their way of doing business. Though Asian countries differ among each other just as much as European countries differ, they do carry some commonalities. Compared to most western countries religion have a stronger influence on life and actions, significant respect to heritage, history and how it affect today and a more flexible perspective on time.⁵⁰

As earlier mentioned in this chapter, culture still differs in many ways. Aligned with this thesis's purpose and delimitations some important factors of Chinese culture are listed below.

- A strong hierarchical society structure.⁵¹
- Confucianism and its ideas of harmonious and balanced social relations,⁵² and the behavior to compromise in order to satisfy the group as an entity, rather than the individual⁵³.
- Quanxi, personal utilitarian relations characterized by unlimited exchange of favors. Rank or structural power is less significant when doing business since personal contact is the single most important factor. Without these relations it becomes impossible to trade or negotiate. It is crucial to know the middleman, not the middleman in the hierarchy but in the social network. An important part in a business relation is the mediating one, the third party that often acts as a guarantor to preserve the relation between to individuals. Finally quanxi often makes processes slower due to the fact that more opinions have to be considered and more people have to be conferred with.^{54,55}
- Contracts are viewed differently than in western countries. When an agreement in Europe or the U.S. always is binding it is in China only

⁵⁰ Helgesson (1996) p. 23

⁵¹ Nassimbeni et al. (2006) p. 34

⁵² Helgesson (1996) p. 58

⁵³ Nassimbeni et al. (2006) p. 34

⁵⁴ Nassimbeni et al. (2006) p. 34

⁵⁵ Helgesson (1996) p. 63

binding if the circumstances do not change. This renders warrants quite obsolete and a more sustainable way of preserving an agreement is to ensure that the other part "lose face" if the contract is broken.⁵⁶

- Since a relation often is seen beneficial in a business like way and not emotionally, the relations is often ended when they end up being profitable.⁵⁷

Above factors are to be considered when doing business with Chinese partners. The factors do vary in significance depending on extent of relation and type of business. One way of easing the negotiations is to engage mediating parts with strong connection and knowledge with Chinese culture.

3.5 Logistics

To address, explain and discuss Logistics a clear definition had to be made. A.J. Van Weele defines the expression "logistics management" in the following way:⁵⁸

"Logistics management aims at optimizing the total flow of goods, from customer demands to the supplier"

The organization CSCMP (Council of Supply Chain Management Professionals) provides a similar approach on the matter.⁵⁹

"Logistics management is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements."

The definition of Logistics Management by Van Weele is rather narrow and only comprehends the flow of goods. CSCMP include Van Weele's definition in theirs and extends the phrase Logistics Management even further. In this thesis the transfer of information is treated in close relation with the transfer of goods, consequently the latter definition is used. The phrase Logistics Management is in this thesis referred to as either Logistics Management or logistics.

There are five basic structures of logistics. These structures are descriptions of different extremes and often exist as hybrids in practice.⁶⁰

⁵⁶ Helgesson (1996) p. 64

⁵⁷ Helgesson (1996) p. 64

⁵⁸ Van Weele (2005) p. 226

⁵⁹ <http://cscmp.org/aboutcscmp/definitions/definitions.asp>, 20080321

⁶⁰ Van Weele (2005) p. 211

- **Making and sending to stock.** Products are manufactured and distributed to various distribution points which are dispersed and located close to the customer. Manufacturing is based on forecasts.
- **Making to stock.** Finished products are kept in stock at the end of the production process and from there shipped directly to geographically dispersed customers.
- **Assembly to order.** Only systems or subassemblies are in stock at the manufacturing centre and final assembly takes place based on a specific customer order.
- **Making to order.** Only raw materials and components are kept in stock. Every customer order is a specific project.
- **Engineering and making to order.** In this situation there is no stock at all. Every purchase or order takes place on the basis of a specific customer or client.

Previous stated characteristics of logistics by Van Weele do not concur entirely with his definition of Logistics Management. Some elements of information handling are addressed in the five structures. With a more extended concern of information, the five basic structures of logistics provide a useful tool to describe and analyze issues of logistics.

Divided into three areas of research; warehousing and storage of goods, information logistics and transportation of goods, the theory of logistics is more comprehensive. A more comprehensive theory eases understanding, analysis of empirics and synergetic contributions with other theories in this thesis.

3.5.1 Warehousing and Storage of Goods

A warehouse implies a temporary stop of the material flow. This is from a supply chain point of view considered a drawback. With this information at hand a storage of goods should always be questioned. The existence of a warehouse is sometime the sign of uncertainties in production or logistics. Japanese manufacturers use a method which is called the “The Japanese lake”, see Figure 9, to discover possible elements of certain stock levels. The method is to decrease stock levels and thereby possible problems within production processes will be evident.⁶¹

⁶¹ http://theses.lub.lu.se/archive/2007/02/14/1171449245-6376-585/Fredrik_Juhlin2CMikael_Serler2CEx-arbete.pdf, 20080321

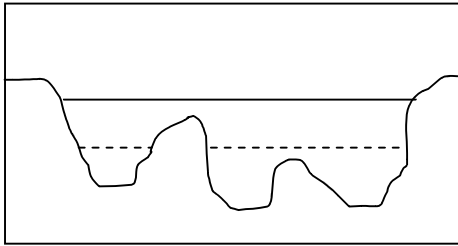


Figure 9: An illustration of the “The Japanese lake” where the water surface is a metaphorical description of stock levels in storage

The objective of a producing company is to satisfy customers. In this phrase lies the objective of delivery certainty. A warehouse could be the solution to a higher delivery guarantee.⁶²

3.5.1.1 Internal Warehouse Processes

The internal processes of a warehouse could be described as a three step model of material flow, see Figure 10.

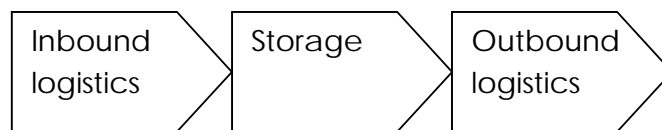


Figure 10: An image of the different processes in a warehouse

Inbound logistics. The process of receiving components and products that are arriving at the warehouse. This process should include standardized solutions for the following parts; unloading from external transportations; control of arriving goods; repacking of goods; tagging; internal transportation.⁶³

Storage. Storage of components and products works as a buffer to optimize operations. There are different objectives of a buffer, but regardless the objective the different buffers should be stored together. The different types of storage are described below;⁶⁴

- **Circulation storage.** The instant stock of components and products that are involved in inbound and outbound logistics.

⁶² http://theses.lub.lu.se/archive/2007/02/14/1171449245-6376-585/Fredrik_Juhlin2CMikael_Serler2CEx-arbete.pdf, 20080321

⁶³ The institute for transportation research and industry literature p. 34

⁶⁴ The institute for transportation research and industry literature p. 39

- **Safety storage.** Uncertainties of variations in demand, variations in inbound logistics, the quality of components and products and of what is the actual amount of stored goods.
- **Readiness storage.** Storage to ensure operations in event of a larger disruption of the supply chain.
- **Levelling and seasonal storage.** A storage depending on seasonal variations in demand or the style of production processes.
- **Process storage.** A storage to as a last part of a production process e.g. cooling etc.

Outbound logistics. The process of loading and sending components and products to the next step in the supply chain through external transportation. Further steps that should be addressed in this process are: repacking, tagging, transportation summary, loading of goods.⁶⁵

3.5.2 Information Logistics

Information logistics and communication concerning the logistics are often a complex issue. An efficient and administrative communication process is a prerequisite for a functioning purchasing and logistics system.⁶⁶ It is also one of the major considerations when sourcing products from abroad.⁶⁷ Even if the issue is discussed in several theories it is often focused on either *what* information to transfer or *how* the information should be transferred. A combination of both *what* and *how* should be examined to attain satisfying results.

Enhancements of the logistics between supplier and customer can often be achieved with a well defined purchasing information system. A proper system to address this issue should incorporate the following elements;⁶⁸

Requisitioning and ordering. Internal information within a company which states article code, general description of item, quantities desired delivery date and the data necessary for finance and administration.

Product and supplier data. The internal requisitioning information when used outside the company e.g. in contact with suppliers. In addition specific supplier identification, product data, price per unit, delivery address, purchase order for follow-up.

⁶⁵ The institute for transportation research and industry literature p. 40

⁶⁶ Van Weele (2005) p. 223

⁶⁷ Nassimbeni et al. (2006) p. 104

⁶⁸ Van Weele (2005) p. 223

Order follow-up. An order must be monitored and to ensure effective monitoring several exception reports should be used e.g. reports of overdue, lack of quality and signaling-reports which are a continuous demand of active status reports from the supplier.

Delivery. Information released when requested order leaves the supplier. This information are later checked when the products arrive, if mismatch occurs in some way, proper actions have to be made. But even more important the event has to be documented and stored to prevent further problems.

Invoice handling and payment. Invoice will be sent to finance and administration where it will be matched to the original order documents, later payment will be delivered to the supplier.

The above presented elements stress one issue more than others, communicate more than necessary. As important it is to send proper information it is to send information at all, corrective actions can be made earlier if misconceptions and problems are identified earlier in the process.

There are several alternatives of communicative equipment and solutions of how information could be confided, examples are given below.

Face-to-face communication is a must on regular basis to maintain a successful sourcing relationship.⁶⁹ **E-mail** is more than often used because of its speed, low cost and user-friendly usage. **Mail** is often slow and costly but available and understandable by most actors. **Telephone** is a favorable tool when addressing urgent issues but time zone differences and costs limit its use with long distance supplier relations. Regarding the alternatives of e-mail and telephone and their characteristics, **faxing** distinguishes as a mix of those. **Teleconferences** enable multi communication between several individuals and this could contribute to less misconceptions and easier problem identification. Cost and resource efforts vary by time differences, number of participants, video and audio utilization.⁷⁰

Another way to communicate is through **Web based communication** e.g. a web site with specifications, order quantities, material requirements etc. developed by a buyer and accessible for suppliers via password and login. This solution demand some initial investments and possible education of suppliers^{71,72}.

⁶⁹ Bonifazi et al. (2006) p. 158

⁷⁰ Nassimbeni et al. (2006) p. 104

⁷¹ Nassimbeni et al. (2006) p. 104

⁷² Bonifazi et al. (2006) p. 158

An **ERP system** is an automated computer system that provides information of production, purchasing and transactions. The investment costs and time of implementation varies greatly due to the degree of responsibility of system and extent of information handled e.g. number of articles, complexity of production etc. Examples are: SAP, Jeeves, Movex, JD Edwards.⁷³

Different tools of communication have different advantages and drawbacks hence they should be utilized in different cases. Often a combination of different communication tools is used but more important is to define mutual plans between buyer and supplier of what tool to be used when.

3.5.3 Transportation of Goods

Investigating the transportation of goods between locations and nodes, from the supplier to the customer is often accompanied by several variables to solve. Schary et al. clarify the initial approach by a division of two categories; 1. Simulation and 2. Optimization and Planning.⁷⁴

A simulation model is a mathematical description of operations or problems with varying level of detail. Simulations are limited by a number of delimitations such as a specific time period, a certain situation etc. The advantage of simulation origins in simplicity when assuming specified contextual conditions. The optimal solution is never guaranteed but successive runs could move you to the answer.⁷⁵

A simulation model could be proven most effective if thorough work is dedicated to the identification of scenarios. If the scenarios and the parameters are carefully chosen the simulation of the optimum case could be possible.

Optimization and planning is a combination of optimization models of linear programming and the identification of important variables. Schary et al. present three classes of these models, the transportation, the transshipment and mixed integer. The transportation model handles one level of transportation from different supplying factories to a specified number of customers. The transshipment model extends the previous model with possible distribution centers as middleman. The mixed integer includes a higher level of complexity e.g. routing products through other supplying factories. With optimization models you are able to find the "right" solution, in theory. In practice it is a matter of computer power, the variables have to be linear to avoid far too complex calculations.⁷⁶

⁷³ Van Weele (2005) p. 225

⁷⁴ Schary et al. (2001) p. 396

⁷⁵ Schary et al. (2001) p. 396

⁷⁶ Schary et al. (2001) p. 402

If provided by a solid base of empirical data simulation models could provide adequate solutions. When faced with several uncertainties and increasing number of variables the aid of computer power and optimization models could hurry up the analytical process.

When proper material flows have been determined, different transportation forms should be analyzed. When dealing with transportation of sourced Chinese production the transportation issue can be complex.⁷⁷ With fast changing prerequisites the parameters for choosing a proper form of transportation changes but the different types of transport alternatives have some specific characteristics.

Transportation by **rail** benefits of relatively low costs and in China one third of all transports are by rail. Some drawbacks are that the form can be inflexible in terms of time and location.⁷⁸

Transportation by **air** is efficient and flexible but far more expensive than all other alternatives, both domestically in China and international.⁷⁹

To transport goods by **road** is the most commonly used transportation form in China. The form is flexible and thereby often preferred for short distances. Unfortunately transportation by road is connected to a relatively higher rate of damaged goods and heavy duties and fees than the other alternatives.⁸⁰

The number one alternative for international freights from China is transportation by **water**, due to large capacity and relatively low costs. In China almost half of the transports are carried out by a few national freight companies. Inland shipping is limited within river proximities and underdeveloped canalization.⁸¹

3.6 Quality

In philosophical terms quality means character or feature. When discussing quality in an industrial context it could be defined as:⁸²

"The quality of a product or service is its capability of satisfying the customers' needs and expectations"

This concurs well with the renowned W. E. Deming's opinion of the aim of quality work in companies:⁸³

⁷⁷ Nassimbeni et al. (2006) p. 146

⁷⁸ Nassimbeni et al. (2006) p. 148

⁷⁹ Nassimbeni et al. (2006) p. 153

⁸⁰ Nassimbeni et al. (2006) p. 155

⁸¹ Nassimbeni et al. (2006) p. 160

⁸² Nationalencyklopedin (1993) b. 11 p. 560

"Quality should be aimed at the needs of the customer, present and future"

In earlier days the industrial view of quality was the products match with specifications. With the definition above, the work with quality involves the entire company and put the process in a wider perspective. On the downside, focusing on subjective measures makes quality work more extensive and proper quality becomes harder to validate. Within a supply chain different manufacturers of components and products do perceive different actors as the customer.

Dealing with quality control for sourced production raises certain questions. Nassimbeni et al. presents a rough division of various types of how to approach quality control; by the supplier at the sourced production facility, by the customer (company ordering the sourced products), by a third party at the sourced production facility and finally by the customer at its own facilities. Pre-transportation and quality checks during transport differ from previous mentioned types but they could still be performed by all of the above stated actors. Approaches suggested by Nassimbeni et al. often require transfer of know-how and thereby a more thorough technical knowledge. A quality control only performed by the supplier at the sourced production facility, is risky and not recommended.⁸⁴

Another work on outsourcing and sourcing by Bonifazi et al. propose the construction of a quality plan. In this plan it is important to consider the "big picture" and addressing quality requirements and goals, the metrics and methodologies, the tools and processes, the deliverables and artifacts, and the audits and inspections. They also raise the question of, how do you determine quality. Originating from the definition of quality e.g. customer satisfaction, a further more detailed breakdown is suggested. Areas of interest is mentioned as number of defects and their origins, ratio of defective, defect-free deliverables and the defect removal efficiency. Finally, cost of quality, cost of defect repairs and defect complexity.⁸⁵

The two theories address quality and quality control differently but they do not contradict each other. While Nassimbeni et al. touches the area synoptically within the context of the supply chain of sourced production, Bonifazi et al. stress the "big picture" importance but leave it up to the reader. Consequently approaching quality control from the view Nassimbeni et al. followed by the areas suggested by Bonifazi et al. would form an adequate process.

⁸³ Deming (1982) p. 5

⁸⁴ Nassimbeni et al. (2006) p. 105

⁸⁵ Bonifazi et al. (2006) p. 157

However there are elements to investigate further concerning the general case of sourced production e.g. tools and processes and audits and inspections. Following examples are given in theory;

Photographic equipment. Either by film or still pictures quality control of process and products could be performed and audited from a far distance of experts when transferring data via the Internet. Initial investments but a rather fast process when put in place.⁸⁶

Pre-sampling inspections. Before actual production of batch or entire orders a small sample should first be controlled and accepted. Real live visits to sourced production facilities could be made to check samples but it is relatively time and resource consuming. Alternatively samples can be sent by mail which is less costly than conduct physical visits at the supplier.^{87, 88}

Quality control manual. A quality control manual serves several purposes; proof of planning, reference base, textbook for training, precedent for future decisions, aid in case of employee turnover and auditing aid. The manual should contain; information about the manual, description of the administration of quality, quality inspection planning, vendor relations, process control, finished goods control, general test methods, measurements, specifics for each product, personnel, government contracts and costs of quality control.⁸⁹

3.7 Supply Chain Management

To define supply chain management an understanding of what the supply chain is has to be gained. Schary et al. describes the supply chain as:⁹⁰

"The flow of the entire set of activities involving the organization and flow of material and other resources to produce and deliver the product to the final customer"

Supply chain management concerns the issue of managing the supply chain and CSCMP provides a detailed description. The description, when studied, refers to nearly the same context as Schary's reasoning.⁹¹

"Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics

⁸⁶ Nassimbeni et al. (2006) p. 105

⁸⁷ Nassimbeni et al. (2006) p. 100

⁸⁸ Nassimbeni et al. (2006) p. 105

⁸⁹ Juran. (1962) section 5

⁹⁰ Schary et al. (2001) p. 23

⁹¹ <http://cscmp.org/aboutcscmp/definitions/definitions.asp>, 20080321

management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies."

The last description clarifies and brings the concept of logistics in direct relation and therefore it is regarded as the definition in this thesis.

The management of the supply chain according to Schary et al. consists of two tasks, one primary and one secondary.⁹²

1. Integrate each stage in the supply chain into a larger system.
2. Manage assets across the supply chain.

To achieve coordination is imperative and elements of reducing quantity of physical assets, reducing costs, improve response to change, are objectives to meet. In a static state this increases return on investment but a well managed supply chain could provide opportunity for strategic advantages.⁹³ The process of managing the supply chain and viewing aspects outside company walls creates opportunities. If identifying and addressing more activities, more possible areas of improvement will be available concerning decreasing cost, capital investment needs and time reduction.

P. B. Schary et al. further explores the building process of a well functioning supply chain and then presents a to-do list of actions, see list below. This list is also useful when evaluating an existing supply chain and its elements.⁹⁴

1. Determine activity requirements to match the objectives of the supply chain.
2. Analyze the cost structures of these activities to establish potential e.g. economies of scale.
3. Determine the optimal configuration of these activities.
4. Define the core competencies of the firm.
5. Identify and select organizations and their subcontractor organizations with the capability to manage these activities.
6. Negotiate with candidate firms to serve the supply chain.

⁹² Schary et al. (2001) p. 35

⁹³ Schary et al. (2001) p. 35

⁹⁴ Schary et al. (2001) p. 420

7. Determine the organizational requirements for coordination, measurement and control.
8. Determine the forms of coordination that participating organizations will use.

Although it is a rather general outlined list of actions it presents a step-to-step process. This is always useful for a company to analyze, identify problems and enhance a supply chain.

3.8 Criticism of Parts and Process

Gathering theoretical knowledge within the several different areas imply problems and opportunities. There is a vast amount of information concerning most of the involved areas by themselves and when added together an even bigger challenge appears. Every part of the theoretical contribution is only scratched on the surface and as a consequence elements of importance might be missed that could have helped the analysis. In chapter 6 some additional specific theories contributing to the recommendations are added as a preventive action.

When evaluating the sources of information there are issues of parts dated a while back in the early 20th century. This does not have to imply that they are obsolete but it is more difficult to identify if they are applicable to solve the issue of this thesis.

The above stated challenges have been addressed and a certain course of action has been taken to avoid consequences. First, in each area several theories have been investigated to ensure applicability and second, tutors and other scholars within the different areas have commented or recommended on different sources of theory.

4. Empirics

In this chapter the relevant empirics gathered is presented and further is the most important data summarized after each category. The outline of this chapter follows the structure of the theoretical framework that was provided in chapter 3. First the gathered empirics related to culture is presented, followed by the data connected to logistics, quality and finally supply chain management.

In this chapter the first part of the fifth and final step is conducted. Relevant empirics are gathered and presented and put in the previously selected boxes that constitute the theoretical framework, see Figure 11.

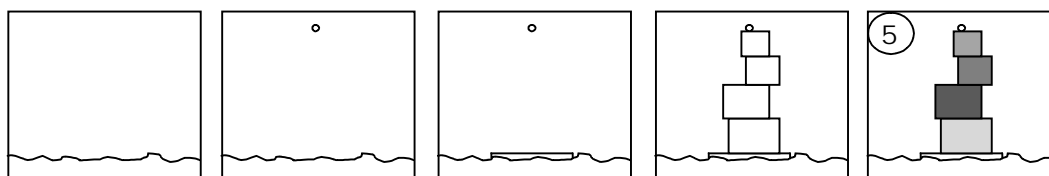


Figure 11: An illustration showing the step conducted in this chapter

To enhance understanding of context when reading the gathered empirics a brief introduction to the relevant actors are given.

Lilleborg

The company is part of Orkla Brands and Norway's largest manufacturer and marketer of branded consumer goods within home and personal care. The company's business includes e.g. activities such as product development, strategy formulation, production, sales and marketing. The product portfolio includes a wide range of well-known brands, most of which are market leaders in their segments. The main office is situated in Oslo and the organization has two different production sites, one in Ski and one in Kristiansund.⁹⁵

Lilleborg is offering premium products with good margins and as a mean to be able to maintain good margins in a price sensitive market the company has started to source various plastic components from China. The products that now have components from China, such as caps etc, are manufactured in the production site in Kristiansund. Hence the focus in our study.⁹⁶

The Plant in Kristiansund

The production site in Kristiansund manufactures several of Lilleborg's products and has done so for more than 30 years. Previously all plastic components and

⁹⁵ www.lilleborg.no

⁹⁶ Business Developer, Lilleborg, 20080303

packaging came from Europe but recently an increasing number of components are being bought in China and are then transported to the plant in Kristiansund.⁹⁷

The site has 15 different production lines, some of them are modern but the majority is quite old. To produce new products with existing plant can sometimes be challenging since the majority of the machinery have to be adjusted to fit the requirements. The plant is flexible and can produce a large number of different products with existing machinery, X different stock-keeping units more precisely. Production is often semi-automatic where manual labor plays a major or minor part in the manufacturing process, depending on the product.⁹⁸

The requirement of manual labor in the production process is sometimes limiting the plant's capacity since it is challenging to find and attract competent employees.⁹⁹ The workers need to be competent and work sufficiently, if not the plant's ISO-certificate might be at stake. It is hard to find staff with short notice, hence it is difficult to fill the extra production shifts needed to increase capacity and meet suddenly raised demands from Lilleborg.¹⁰⁰

Fluctuations in demand from Lilleborg make it hard to formulate an accurate production plan and as a consequence extra shifts might have to be added, shifts that sometimes are hard to fill. Another consequence to the fluctuations is the fact that the production is not running as efficient as possible. Rapidly changing demands create changes in the production plan that might enhance the number of set-ups and e.g. affect the planned and most favorable length of a specific batch. Today over X set-ups are made annually in Kristiansund, each set-up costs X-X NOK and takes in average X hours. Production rate is in average X units per day, a figure that could be increased if the number of set-ups were diminished or with a decrease in length of every set-up.¹⁰¹

Procurement Shanghai

The office in Shanghai serves as a communication link between the plant in Kristiansund, Lilleborg and the Chinese manufacturers of plastic components. Currently, the office has got three employees with following responsibilities;¹⁰²

- Look for potential suppliers
- To evaluate the suppliers by following

⁹⁷ Quality Control, Kristiansund, 20080304

⁹⁸ Technical officer, Kristiansund, 20080304

⁹⁹ Procurement, Kristiansund, 20080304

¹⁰⁰ Technical officer, Kristiansund, 20080304

¹⁰¹ Technical officer, Kristiansund, 20080304

¹⁰² Procurement, Shanghai, 20080313

- code of conduct
- technology and production capability
- cost and quality
- lead time,
- terms of payment and test method.
- To do feasibility analysis to the project from marketing dept.
- Follow up tools to be made and evaluate its samples.
- To assist R&D dept. to complete specification of all components.
- To check technical drawings and contribute with comments and suggestions.
- Follow up purchasing order and monitor the product quality.
- Quality inspection at beginning of production and before shipment to Norway.

Manufacturers in Shanghai

Chinese economy has developed at high speed since the end of the 1980ies, however, economic growth between coast cities and other cities is unbalanced and the differences between the regions is remarkable. Suppliers for packaging containers are mainly located at eastern and southern cities of China, such as Shanghai, Zhejiang, Jiangsu and the Guangdong province. In the Zhenjiang province there is a number of successful suppliers, most of them famous for their low prices and high quality, which produce plastic tools and plastic components.¹⁰³

4.1 Business Culture

In this section the most important issues and characteristics of cultural differences between Norway and China in the operations of Lilleborg are addressed. Further, opinions of best way practices gathered from external sources outside Lilleborg are presented.

Western business culture implies that all information and circumstances concerning an agreement is put on a contract. The business relation then relies on the contract and defines appropriate actions. Chinese culture on the other hand depend more on personal relations than on the actual contract. If the circumstances change, the contract can become obsolete and this is unfamiliar for organisations in western business.¹⁰⁴

There are some differences in the view of production and product development. Chinese manufacturers apply some sort of "Trial and error"-process and from a

¹⁰³ Procurement, Shanghai, 20080313

¹⁰⁴ Business developer, Lilleborg, 20080303

Norwegian point of view Chinese manufacturers are less planned than western ones.¹⁰⁵ This implies a prolonged start-up with Chinese suppliers but nevertheless a working relationship.¹⁰⁶ Western suppliers from Europe are on the other hand much more focused on getting the production perfect from the beginning.¹⁰⁷

The different views on production affect the process of quality control when engaging relations with Chinese suppliers. Lilleborg has a policy of 99 % delivery guarantee to their customers. This demands appropriate quality on components on every single order.¹⁰⁸ Due to this factor the majority of efforts when working with suppliers have concerned quality. It has come to understanding that Chinese manufacturers have a different view on quality, e.g. are not used to the high demands of Lilleborg.^{109,110,111}

When officials in Norway discuss products with Chinese officials there have been misunderstandings. These misunderstandings are founded in different views of to who the products are designed for. The Chinese often focus on the production processes, operations in Norway have the end consumer in mind.¹¹²

Western organization value feedback and a critical mind and eye since this enhance operations and increase possibilities of noticing problems early. Chinese businesses are more hierarchical and an open dialogue is harder to establish.¹¹³ Feedback is not often delivered due to the importance of not "losing your face". To "lose your face" means to acknowledge a failure of performance. This implies a more accepting and less critical way of working.¹¹⁴

In Lilleborg's operations between China and Norway, the Norwegian officials are reluctant to sign agreements "too fast".¹¹⁵ There are always plans for possible future events and/or challenges, Chinese however believe in a framework where the details fall in to place as time goes by.¹¹⁶

Two issues that reduce flexibility of operations are the dependences of Lilleborg's business developer and the close personal engagements of Chinese business

¹⁰⁵ CEO, Lilleborg, 20080303

¹⁰⁶ Sourcing director, Lilleborg, 20080303

¹⁰⁷ Quality control, Kristiansund, 20080304

¹⁰⁸ Logistics, Lilleborg, 20080303

¹⁰⁹ CEO, Lilleborg, 20080303

¹¹⁰ Procurement, Kristiansund, 20080304

¹¹¹ Quality control, Lilleborg, 20080303

¹¹² Production, Kristiansund, 20080304

¹¹³ Business developer, Lilleborg, 20080303

¹¹⁴ Logistics, Lilleborg, 20080303

¹¹⁵ Procurement, Shanghai, 20080312

¹¹⁶ Chief representative Borregard, 20080312

relations. These elements exist due to strong respect of relations and superior officers in Chinese culture.¹¹⁷ Apart from flexibility issues there have been inactivity in the relations due to cautiousness from different actors. It is a political issue but the internationalization and more active relations are inevitable in today's business.¹¹⁸

When doing business in cross-cultural environments you have to regard different national events and the different calendars. E.g. during the Chinese new year celebration the whole commercial part of China stops.¹¹⁹ These events should especially be regarded when ordering and estimating time to market.¹²⁰

Relations and traditions are much more important in China than in western culture while contracts are of minor importance.¹²¹

4.2 Logistics

Overall logistic issues for sourced production in China concern time to market and cost structures. When producing at the other side of the globe there bound to be some prolonging in time to market and this challenges activities related to planning and procurement. Even though there are differences in time to market depending on where the supplier is situated, they are not so significant. What Chinese production lacks in transportation time it makes up for in faster response time to purchasing orders.¹²²

Main characteristics of Chinese production are low production costs and high transportation costs. Low production costs originate from lower wages and high transportation costs are due to long geographic distances but mainly inefficient inland logistics. Lilleborg's suppliers are situated near the harbor so the amount of money spent on relatively expensive inland logistics is limited.¹²³

4.2.1 Warehouse

Currently Lilleborg's storage levels in warehouses is managed manually with the help of relevant theoretical models. Safety stock and logistics are two different factors that affect storage levels. At Lilleborg the safety stock is crucial due to the 99 % delivery guarantee within 24 to 48 hours to their customers.¹²⁴

¹¹⁷ Business developer, Lilleborg, 20080303

¹¹⁸ Chief representative Borregard, 20080312

¹¹⁹ CEO, Lilleborg, 20080303

¹²⁰ Procurement, Shanghai, 20080312

¹²¹ Knud Midtgaard, 20080311

¹²² Business developer, Lilleborg, 20080303

¹²³ Business developer, Lilleborg, 20080303

¹²⁴ Logistics, Lilleborg, 20080303

To enhance quality control for sourced components from China, some sort of new storage of manufactured products should be arranged and this could be arranged in different ways.¹²⁵ Lilleborg can either establish a warehouse as an integrated part of the shipping firm's operations¹²⁶ or set up a privately owned one. A suitable location for the warehouse is the Pudong area since the container terminal is located there.¹²⁷ If the shipping firm should account for storage it would probably imply significant costs while a privately owned warehouse could be built on a spot already owned by Orkla. This since another Orkla subsidiary, Borregard, already has got a postbox in the specific area.¹²⁸

A warehouse in Shanghai would carry advantages and drawbacks for the sourced production process. Possibilities of enhancing supervision,¹²⁹ coordinating transport, and easing estimation of demand are three major pros.¹³⁰ Another advantage is the possibility of performing thorough quality control in China which will reduce costs of inadequate products being sent to Norway. This will be even more evident if Lilleborg owns and manages the warehouse themselves.¹³¹

There are different views concerning quality control combined with a warehouse. Quality should rather be checked in production or at production site than in a warehouse. A preliminary storage could enhance the process but only marginally.¹³² To establish a warehouse with the purpose of quality control is unnecessary.¹³³ The anomalies that could be detected would be transportation damages occurred from production to storage, other parameters should be detected earlier.¹³⁴ Further drawbacks with establishing a warehouse include, prolonged time to market, more complex process¹³⁵, high costs¹³⁶ and risks of piracy (illegal copying of design, process or components). Finally, there are repeated incidents of theft when storing products in Shanghai, which impose a possible risk.¹³⁷

There are a number of alternatives to a warehouse in Shanghai, Lilleborg can either establish it at different locations and/or in different steps in the supply

¹²⁵ Business developer, Lilleborg, 20080303

¹²⁶ Sourcing director, Lilleborg, 20080303

¹²⁷ Chief representative Borregard, 20080312

¹²⁸ Business developer, Lilleborg, 20080303

¹²⁹ Chief representative Borregard, 20080312

¹³⁰ CEO, Lilleborg, 20080303

¹³¹ Business developer, Lilleborg, 20080303

¹³² Sourcing director, Lilleborg, 20080303

¹³³ Marie Lange, 20080307

¹³⁴ Charlotta Johnsson, 20080311

¹³⁵ Sourcing director, Lilleborg, 20080303

¹³⁶ Chief representative Borregard, 20080312

¹³⁷ Chief representative Borregard, 20080312

chain. One option is a finished goods inventory at the supplier site.¹³⁸ This brings the possibility of better quality control closer to the actual production. Another option is to establish a storage of finished products in Kristiansund. This alternative would enhance production processes in Kristiansund with the possibility of larger batch sizes and decreased set-up costs.^{139,140}

An important factor to consider when to establish a warehouse is to place the storage in most critical part of the chain. The step in the supply chain between the production in Kristiansund and node in Oslo is critical because of the high demand of delivery guarantee to Lilleborg's customers. With storage in Kristiansund this objective would be easier to achieve.¹⁴¹

4.2.2 Communication

To be able to describe the relevant communication processes of Lilleborg a number of independent relations are stated below.

Lilleborg (Oslo) - Lilleborg (Shanghai). This relation is significant when assessing possible suppliers for sourced production and various parts of Lilleborg in Oslo are participating e.g. logistics, sourcing and the business developer. The business developer at Lilleborg is responsible for the employees, procurement officials, in Shanghai. Communication is performed with e-mail, telephone, web camera and by physical visits. The most commonly used equipment by the business developer is the telephone and the way of communicating is dependent on whom the other part is.¹⁴²

At present time there is too much resources spent on traveling, it is an objective to decrease the frequency of travels. Due to the respect of superior officers from Chinese officials communication is routed unnecessarily through the business developer, previously mentioned as a cultural aspect.

With all communication it is important to not make room for misinterpreting, it has to be distinct. This part becomes even more critical with cross-cultural communication.¹⁴³

Lilleborg (Oslo) - Sourced production (Shanghai). This relation involves different officials at Lilleborg in Oslo but also Lilleborg in Shanghai and officials from the facility in Kristiansund, especially during the initiation and development

¹³⁸ Sourcing director, Lilleborg, 20080303

¹³⁹ Production, Kristiansund, 20080304

¹⁴⁰ Charlotta Johnsson, 20080311

¹⁴¹ Charlotta Johnsson, 20080311

¹⁴² Business developer, Lilleborg, 20080303

¹⁴³ Marie Lange, 20080307

process of the production of a new component. Previously, and in some extent still they still do, Lilleborg used an agent, Nordic stream, in this process. The company has begun to perform more of this themselves which has led to more involvement from logistics, sourcing and product development. The tasks concern agreement formulation which is a modified standard from Orkla, generating product specification and enhancing supplier relations.¹⁴⁴ After the start-up it is the business developer who has the main responsibility for the supplier relations at Lilleborg in Oslo but if a problem would rise, the proper institution would be involved e.g. logistics if there is damages due to transportation.¹⁴⁵

One challenge with the producers in China is the lack of standardized agreements. They are produced from a standard format but are often more modified than those used with the European suppliers, which aggravate communication when dealing with China.¹⁴⁶ Lack of English language skills has also been of concern, sometimes it is only one employee at the supplier that can speak English adequately.¹⁴⁷ The geographical distance between China and Norway has affected the communication and further the process of quality control and time to market.¹⁴⁸ There is an urge of better relations and supervision of suppliers due to Lilleborg's high delivery guarantee.¹⁴⁹

Product development at Lilleborg should perform all of the communication during the development phase. It is important that there is only one representative who handles the communication at both sides, to lessen confusion.¹⁵⁰ This communication should be performed via a standardized form of conduct.¹⁵¹

Lilleborg (Oslo) - Ello (Kristiansund). This relation involves several officials at both locations when Lilleborg engage in the sourcing of a new component from China. It has to be confirmed that the component is applicable with the production equipment in Kristiansund and the sales and marketing for Lilleborg.¹⁵²

Further when full scale production is running a business system, SAP (System Applications and Products), with input from Lilleborg in Oslo determine relevant volumes. This data is automatically sent to Ello with updates once a week up to

¹⁴⁴ CEO, Lilleborg, 20080303

¹⁴⁵ Business developer, Lilleborg, 20080303

¹⁴⁶ Logistics, Lilleborg, 20080303

¹⁴⁷ Business developer, Lilleborg, 20080303

¹⁴⁸ Quality control, Lilleborg, 20080303

¹⁴⁹ CEO, Lilleborg, 20080303

¹⁵⁰ Marie Lange, 20080307

¹⁵¹ Knud Midtgaard, 20080312

¹⁵² Business developer, Lilleborg, 20080303

once a month and procurement in Kristiansund translates the updates to purchase orders.¹⁵³

Sometimes it becomes unnecessary complicated when addressing quality issues that concern the sourced production. Problems could possibly be handled by Kristiansund alone and a feeling of too thorough inspections has been noted because the components are produced in China.¹⁵⁴

Ello (Kristiansund) - Lilleborg (Shanghai). Procurement in Kristiansund, as mentioned before, receives an order from Oslo through SAP. They translate the order and then by e-mail they send a purchase order to Lilleborg's representatives in Shanghai. The purchase order is a standard form containing e.g. addresses, terms of delivery and payment, delivery date, item, material, amount and price/unit, see Appendix 2. The sent purchase order is confirmed by procurement in Shanghai with a reply.

Better communication between the production facility in Kristiansund and procurement in Shanghai is desirable according to the business developer at Lilleborg.¹⁵⁵ Although procurement in Kristiansund almost always receives an "ok" from Shanghai it is sometimes an "ok" of an order that is impossible to complete e.g. not enough production capacity. As a result misunderstandings and confusion appear and cause problems. An improved focus on establishing more standardized and efficient processes have been initialised but it is a slow progress.¹⁵⁶

Sometimes procurement in China asks for documents from Kristiansund that actually Lilleborg in Oslo has and this results in misunderstandings. Improvements could be made by enhancing communication processes and the sharing of information. It is important that both parts have the same image of products, production and quality to avoid misunderstandings.^{157, 158}

When dealing with long distance communication it is important to involve handshaking, which means to always confirm sent information with an acknowledgement. A launch of a communication system has both benefits and drawbacks. It could imply large technical investments but this has to be weighed against the benefit of less confusion within the system. An example of a standardized communication procedure could be a body of an e-mail following

¹⁵³ Procurement, Kristiansund, 20080304

¹⁵⁴ Quality control, Kristiansund, 20080304

¹⁵⁵ Business developer, Lilleborg, 20080303

¹⁵⁶ Procurement, Kristiansund, 20080304

¹⁵⁷ Production, Kristiansund, 20080304

¹⁵⁸ Quality control, Kristiansund, 20080304

the following principle: substantive followed by a verb and priority e.g. **1000 caps- Produce- Urgent**.¹⁵⁹

Ello (Kristiansund) - Sourced production (Shanghai). The production in Kristiansund and the sourced production facilities are involved in the development of a new product. The objective is to ensure proper quality and that the components produced in China fits equipment in Kristiansund. The communication is often through the procurement officials in Shanghai e.g. they visit Kristiansund and then communicate with the sourced production facilities in China.¹⁶⁰

It is important that all communication regarding troubles, problems and quality failures are reported to product development and sourcing in Oslo. This is to ensure that all information is taken into account when evaluating suppliers.¹⁶¹

Lilleborg (Shanghai) - Sourced production (Shanghai) - Procurement officials at Lilleborg in Shanghai have close contact with the Chinese suppliers, i.e. the sourced production facilities. The contracts with suppliers include code of conduct, specification, terms of payment, contract period, route of adjusting prices and solution of disputes. The contracts are written in a standardized format but there are differences depending on the supplier, e.g. Minimum Order Quantity (stated by the supplier), safety stock.¹⁶²

Procurement in Shanghai translates the purchase orders from Kristiansund to an excel form that is understandable for the suppliers. When there is trouble of some sort with the suppliers procurement in Shanghai plays a vital part negotiating between Norway and Chinese suppliers.¹⁶³

4.2.3 Transportation

The Chinese manufacturers pay for transportation by truck between the production site and harbor.¹⁶⁴ Suppliers contact Lilleborg's shipping agent, DSV, and make arrangements e.g. at what time and date the empty container shall be at the production site and the size of the container. The shipping agent provides containers and pick up goods, while the supplier apply for custom clearance at the customs house and deliver the documents of custom clearance to the shipping

¹⁵⁹ Charlotta Johnsson, 20080312

¹⁶⁰ Production, Kristiansund, 20080304

¹⁶¹ Charlotta Johnsson, 20080312

¹⁶² Procurement, Shanghai, 20080312

¹⁶³ CEO, Lilleborg, 20080303

¹⁶⁴ Business Developer, Lilleborg, 20080303

agent. The shipping agent delivers the container to the shipping company at the port of loading.¹⁶⁵

No fixed shipping company is used, 2-3 different shipping firms are relevant and lately more Chinese companies have been contracted such as Yangming and Cosco.¹⁶⁶ The shipping arrangements are set up for each individual order and the ordered quantity fit either into a 20 ft container or a 40 ft container. Before placing an order Lilleborg calculates how many components that fit into a container and hence this is considered when deciding on how many components to order. Further the specific container can be tracked by container number, name of vessel and voyage number. No RFID- tags are currently used due to high costs and lack of possibilities for introduction in China.¹⁶⁷

The shipping agent, DSV, picks up the containers in Oslo and palletizes the components. The components are shipped in a container since more components fit in a container than on a pallet. In Oslo the components are put on pallets and later transported by the shipping agent by lorry to Kristiansund. To palletize components in Oslo takes time and can sometimes be challenging if there are many various components in the same container. Time can be saved in Oslo by shipping pallets from China instead of containers filled with components but on the other hand it is going to be more expensive.¹⁶⁸

Lilleborg applies FOB (Free on Board) price for the suppliers, which means that suppliers take all responsibility for transportation damages etc. from their factory to port of loading.¹⁶⁹ Damages on goods due to transportation do not occur frequently but when they do it might be difficult to sort out who is responsible. Sometimes the shipping firm blames the manufacturer and the manufacturer blames the shipping agent and vice versa. Since no quality control exist between the production site in Shanghai and the site in Kristiansund it is tricky to determine where the damages occurred.¹⁷⁰

Shipping costs from China are quite low¹⁷¹ and transportation costs are not a significant factor when summarizing the total costs of the decision to source from China¹⁷². To use a shipping agent to pick up containers by truck is an adequate

¹⁶⁵ Procurement, Shanghai, 20080313

¹⁶⁶ Chief Representative Borregard, 20080313

¹⁶⁷ Procurement, Shanghai, 20080313

¹⁶⁸ Procurement, Kristiansund, 20080304

¹⁶⁹ Procurement, Shanghai, 200803013

¹⁷⁰ Logistics, Lilleborg, 20080304

¹⁷¹ Robert Lindroth, 20080317

¹⁷² CEO, Lilleborg, 20080303

decision.^{173,174} Nonetheless it might be important to consider putting components in container directly after production to eliminate an unnecessary packaging step or to use space efficient pallet racks and palletize the components before shipping.

The current transport operations constitute a coherent and feasible way for Lilleborg to source products from China without taking any high risks or making large investments.¹⁷⁵

4.3 Quality

To be able to maintain and improve Lilleborg's market position it is of utmost importance to deliver products that obtain very high quality standards¹⁷⁶. Quality work is involved in many processes, both strategically and operationally, and it is something that is highly considered when e.g. developing new products. When sourcing components from China the procedure is the following¹⁷⁷;

Step 1. Product development at Lilleborg creates a prototype of the specific component. The prototype is the result of many various considerations where consumer satisfaction is in focus. After the "ideal component" from a consumer's point of view has been developed, an iterative process between product development at Lilleborg and a Chinese manufacturer starts. If the component is not realistic and feasible considering production technology the prototype has to be corrected to fit the manufacturer's requirements. When product development at Lilleborg is satisfied with the prototype, regarding consumers' demands and production feasibility, a specification is made and sent to the Chinese manufacturer.¹⁷⁸ To conduct part of the product development in China is associated with challenges, such as communication problems and increased administration costs, but on the other hand it makes the final implementation less complex and much smoother to accomplish.¹⁷⁹

Step 2. To make sure that the Chinese manufacturer can produce components after the final specification a number of test batches of components are sent to the production site in Kristiansund for control. Even this is often an iterative process where a number of components are sent back and forth to Kristiansund. The components are often rejected because of poor comparability with the final specification and the Chinese manufacturer has to go through the production

¹⁷³ Robert Lindroth, 20080317

¹⁷⁴ Charlotta Johnsson, 200803011

¹⁷⁵ Procurement, Shanghai, 20080313

¹⁷⁶ CEO, Lilleborg, 20080303

¹⁷⁷ Packaging, Lilleborg, 20080303

¹⁷⁸ Packaging, Lilleborg, 20080303

¹⁷⁹ Business Developer, Lilleborg, 20080303

process again, make necessary adjustments and send a new test batch. Not before quality control in Kristiansund has approved a large test batch, the manufacturer can start to run a full scale production of the specific component.¹⁸⁰

4.3.1 Quality Control in China

Quality control is currently performed both at the Chinese production site and at the site in Kristiansund. In China quality controls are conducted in the production process by workers at the site and by Lilleborg's representative in Shanghai.¹⁸¹ The representative controls a small sample before the components are transported by truck to the port of loading in Shanghai. If the representative acknowledges any quality issues he stops the production and reports to Lilleborg in Oslo.¹⁸²

Lilleborg's representatives in Shanghai have many tasks to conduct in their job description where quality control is just one amongst many others¹⁸³. Quality control is not always conducted as often and throughout as needed and components with defects have been transported to Kristiansund. By having a representative that is responsible for quality control, controls can be conducted more frequently and more throughout.¹⁸⁴ By developing relevant routines and parameters for the current quality controls, see Appendix 3 for an authentic inspection report, it would be easy to conduct efficient quality controls by a third part or by a representative from Lilleborg¹⁸⁵.

Quality control in the production process is of great importance since the earlier a quality error is detected the better. Every step in the production process adds value and it is wasteful to add extra value to a product that needs to be scrapped.^{186, 187, 188, 189} To focus on improving quality control at the Chinese production site is relevant since enhancements are necessary to guarantee that only high quality components are sent to Kristiansund. Today controls are conducted in the plants but maybe not as often or correct as wanted.¹⁹⁰ A tendency not to understand why the quality of the component has to be so high or what impact and damage an incorrect component can cause at the plant in Kristiansund has been

¹⁸⁰ Quality Control, Kristiansund, 20080304

¹⁸¹ Business Developer, Lilleborg, 20080303

¹⁸² Procurement, Shanghai, 20080313

¹⁸³ Procurement, Shanghai, 20080313

¹⁸⁴ Business Developer, Lilleborg, 20080303

¹⁸⁵ Packaging, Lilleborg, 20080303

¹⁸⁶ Quality Control, Kristiansund, 20080304

¹⁸⁷ Product Development, Lilleborg, 20080303

¹⁸⁸ Marie Lange, 20080307

¹⁸⁹ Charlotta Johnsson, 20080311

¹⁹⁰ Packaging, Lilleborg, 20080303

acknowledged from Chinese manufacturers.¹⁹¹ By inviting Chinese manufacturers to the plant in Kristiansund and show how low tolerances the plant has maybe enhances their understanding of how important it is to manufacture components that fulfill the specification.^{192,193,194}

To develop an instruction video in Chinese on how to conduct quality controls can be one way to improve quality and to put up very pedagogical pictures in the plant.¹⁹⁵ However it is important for Lilleborg to be integrated in the process, set guidelines and be involved in the implementation since Chinese manufacturers tend to have a slightly more relaxed view of quality in the production process. A tendency has been acknowledged that Chinese manufacturers seem to prefer to scrap incorrect components and put a lot of trust of detecting these, instead of applying a zero-fault culture and focus on doing the right thing from the beginning.¹⁹⁶

To conduct more frequent visits to the Chinese manufacturers and do follow-ups may enhance quality since the quality level seems to decrease after a certain level of time. When meeting management it is very important to make them understand what Lilleborg expects considering quality as well as cooperation.^{197,198} To be present when implementing the production of a specific component and participate on how to conduct quality controls etc. can be seen as one way to improve quality as well as creating a good foundation for collaboration.¹⁹⁹

4.3.2 Quality Control in Kristiansund

Quality control in Kristiansund is conducted at line, in line and out of line. A small sample is taken to a laboratory at arrival, and if no signs of quality errors occur the components are considered to have the quality level needed and are used in the production process. At line controls, i.e. visual inspection, are conducted by employees at the machines and so are at line controls, i.e. a sample is taken from the production line and inspected and then put back.²⁰⁰

So far no major quality errors have occurred regarding components from china, but sourcing from China can be quite a hassle anyway. Sometimes it takes up to

¹⁹¹ Packaging, Lilleborg, 20080303

¹⁹² Logistics, Lilleborg, 20080304

¹⁹³ Product Development, Lilleborg, 20080303

¹⁹⁴ Quality Control, Kristiansund, 20080304

¹⁹⁵ Packaging, Lilleborg, 20080303

¹⁹⁶ Quality Control, Kristiansund, 20080304

¹⁹⁷ Packaging, Lilleborg, 20080303

¹⁹⁸ Technical Officer, Kristiansund, 20080304

¹⁹⁹ Marie Lange, 20080307

²⁰⁰ Technical officer, Kristiansund, 20080304

two years before Kristiansund can approve and say “go” to full scale production of components. This due to an often long process of small test batches which have to be scrapped due to poor quality, often regarding dimension inaccuracy. To choose a Chinese supplier that guarantees a high level of quality even if the prices are a little higher might be more cost efficient for Lilleborg in the long run.²⁰¹

4.3.3 Quality Considerations

To involve Chinese manufacturers early in the production development process lowers some of the development costs such as investments in tools etc. as well as making the final implementation easier. Dies and other tools needed in the development process are much more affordable in China. A tool that costs X NOK to buy in Norway costs around X NOK in China. The quality of the tool on the other hand might not be as good in China as in Norway. Currently ZZ-Mould is the manufacturer that has highest quality on their tools, maybe it would be possible to use their tools even at other production plants.²⁰²

By involving Chinese manufacturers early in the development process, some steps might take much longer time than if the manufacturer was more closely situated. The savings from buying cheaper tools and lower labor costs might be eliminated by travel expenses, freight costs, quality problems and communication difficulties, not to mention the risk of increased time to market. To develop the prototype and final specification in cooperation with a local manufacturer and then sending the specification to the Chinese manufacturer could be an alternative that shortens time to market and eliminates communication problems and unnecessary freight costs.²⁰³

When setting guidelines on how to measure quality and comparability with specification it is central to eliminate any risks of misunderstandings and subjective interpretations. It is critical that the person understands *what* to measure, *when* to measure and *how* to measure it. It is central that the procedures for the control are investigated and fixed to eliminate misunderstandings and quality problems, e.g. the diameter of a product may be different before and after wash.²⁰⁴

The plant in Kristiansund sometimes needs to scrap many components from China due to poor quality.²⁰⁵ To let the manufacturers send a small sample of components by mail to Kristiansund and get them approved before sending the

²⁰¹ Quality Control, Kristiansund, 20080304

²⁰² Business Developer, Lilleborg, 20080303

²⁰³ Charlotta Johnsson, 20080311

²⁰⁴ Charlotta Johnsson, 20080311

²⁰⁵ Quality Control, Kristiansund, 20080304

container reduces the risk of paying unnecessary freight costs. Not only can unnecessary freight costs be eliminated, the plant in Kristiansund can also be more certain that the container is filled with correct components and consequently reduce the risk of scarcity in the production process.²⁰⁶ To send real samples is best since it is difficult to see and study circular objects on a photography²⁰⁷.

Another important thing to consider is whether the tolerances in the specification need to be as tight as they are today. By having very tight tolerances investments in quality controls and production processes may rise. It is expensive to have very tight tolerances and it is important that the measurement is relevant. If it is not, why spend time and money to strictly obtain a specific but irrelevant value?²⁰⁸ By making the plant more flexible considering allowance of greater tolerances the production process can be smoother and the number of stops and the number of products that need to be scrapped can be reduced. Even the production process in China might be more cost efficient and less time and money have to be spent on precise quality controls.²⁰⁹

4.4 Supply Chain Management

Lilleborg has a strong end consumer focus in all of its operations. This combined with an objective of high delivery guarantee pushes the organization and its parts to work efficient.²¹⁰ The company has four vendors which are their primary customers; ICA, Coop, Rema1000 and Norgesgruppen. When a vendor is placing an order Lilleborg has 24 to 48 hours until the products should be in Lilleborg's warehouse in Oslo, ready to be picked up by the specific customer.²¹¹

Lilleborg always addresses business issues with the whole supply chain in consideration.²¹² When processing orders from customers every part in the supply chain and every part at the administration receive scheduled time frames.²¹³ There are present issues that have affected delivery successes e.g. marketing department and sales sometimes accept to narrow time frames for campaigns and due to rigidness of production equipment and staff shortages in Kristiansund they are sometimes unable to respond to tighter schedules.²¹⁴

²⁰⁶ Marie Lange, 20080307

²⁰⁷ Packaging, Lilleborg, 20080303

²⁰⁸ Marie Lange, 20080307

²⁰⁹ Charlotta Johnsson, 20080311

²¹⁰ Business developer, Lilleborg, 20080303

²¹¹ Logistics, Lilleborg, 20080303

²¹² Sourcing director, Lilleborg, 20080303

²¹³ Logistics, Lilleborg, 20080303

²¹⁴ Logistics, Lilleborg, 20080303

Sourced production in China challenges the work with the supply chain. Current activities in China do sometimes carry prolonged time to market. There have been cases of delivery failures that have resulted in increased costs. It is a chain with several steps and long geographic distances. To optimize the supply chain and reduce stock levels better communication and closer relations are necessary, e.g. between procurement in Shanghai and procurement in Kristiansund.²¹⁵

²¹⁵ Business developer ,Lilleborg, 20080303

5. Analysis

In this chapter the gathered empirics are discussed and analyzed from a theoretical point of view. The outline for the chapter is the same as for the previous chapters. The different areas of interest are discussed and the activities of Lilleborg are investigated. This analysis is concentrated on identifying possible areas of improvement and providing results that is used in chapter 6. The last part of this chapter concerning supply chain management address the issue of supply chain optimization for sourced production as a whole.

The second part of the final step in the tower of theory is conducted in this chapter, see Figure 12. Gathered empirics have been put into the various boxes and now the data is analyzed from the surrounding theoretical framework's perspectives.

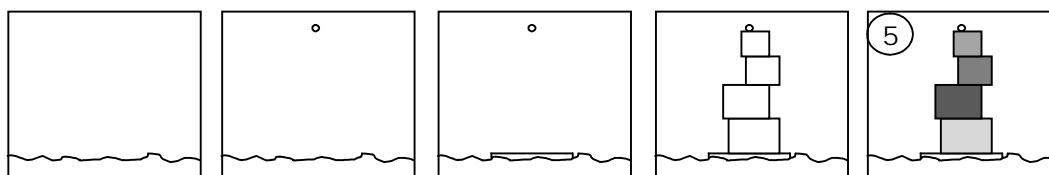


Figure 12: An illustration showing the step conducted in this chapter

5.1 Business Culture

When studying the international relationships within the operations of Lilleborg it is clear that there are misunderstandings and challenges that origin from cultural differences. Although, there is a widespread knowledge of the existence of differences there are shortcomings when discussing actual specific practical issues with the cross-cultural relations. To clarify and somewhat simplify with a statement; officials in both cultures know of each other's preferences but they are still determined that their own way is the only way for best practice. The statement describe both type 1 and type 2 problems when regarding Helgesson's studies.

It is evident that the different areas of concern in the case of Lilleborg can be linked to the most commonly addressed issues when engaging cross-cultural relations between western and Chinese businesses. Different views of contracts, the importance of personal relations in Chinese culture, differences in hierarchical structure, power distance etc are all examples of issues that exist in this case. E.g. the opinion from a Norwegian employee that Chinese officials have stronger respect for superior officers, is evidence of different power distances.

Occurrences that can be identified and linked to cultural misconceptions have resulted in prolonged development time and test production time, shortcomings in stock and failure to deliver. Increased costs and customer dissatisfaction have been the consequences of these events.

To avoid future problems Lilleborg should utilize more personal contacts, e.g. face-to-face meetings early in the development and relations processes. Another possibility would be to arrange teamwork assignments with participants from the different actors involved. This enhances understanding and gives an opportunity to observe not what every participant say but more important how they act.

Educations over different cultures, Lilleborg's objectives and values and personal interactions are means that are fairly cost efficient. These activities could enlighten the different parts and improve collaboration through the supply chain and also within Lilleborg.

5.2 Logistics

Lilleborg's engagement in the sourcing of components from China can be described as a combination of "making to stock", "assembly to order and "making and sending to stock" process when categorizing it with theory. This makes it a rather complex process and the reasons are that different products are produced, soled and marketed in different ways.

5.2.1 Warehouse

Beside the warehouse of final products in Oslo there are some minor occasions of storage through the supply chain. The suppliers do have some storage of components that could be regarded as a circulation storage. Furthermore, there is a stop in the material flow when shipments of components arrive in Oslo due to repacking of goods before transportation to the production facility in Kristiansund.

The storage of the final products is in general terms a safety storage. Lilleborg is currently regarding theoretical models when calculating appropriate stock levels. Due to the long transportation and few stops in the material flow there are few opportunities of quality control and transportation summaries. Overall the occurrence of quality defects and other troubles have been sparse but costly.

There has been no adaptation of the "Japanese lake" which could, when applied, identify the issues to address to avoid future troubles. Although a storage with the objective of quality control is unnecessary, a leveling storage in Kristiansund could enhance the somewhat stretched production in Kristiansund. Another possible solution would be to store larger quantities in Oslo.

Empirical findings suggest not establishing a new warehouse at the moment to enhance quality and delivery assurance. This is supported partially by theory, which states that the existence of storage always should be questioned and to store products is not a purpose by itself.

5.2.2 Communication

There are several communication issues in Lilleborg's operations. During the development process there have been confusing events of not knowing whom to contact. This combined with uncertainty when to communicate creates rather unclear operations.

Almost every communication channel lacks structured routines and standardized processes. This is more manageable when dealing solely with European relations where cultural differences and time differences plus geographical distances are less evident. But in cross-continent relations, especially with a culture as the Chinese differs much from the European, it is important to establish defined routines.

The different channels are discussed separately below.

Lilleborg (Oslo) - Lilleborg (Shanghai). During the early stages of relations Lilleborg should utilize face-to-face communication more. Somehow a decrease in the number of involved parts and more clearly defined roles (responsibilities and assignments) of each participating employee should be formed.

Lilleborg (Oslo) - Sourced production (Shanghai). As mentioned in the previous note Lilleborg should address areas of standardization and the number of involved parts. The distance is a critical issue and again it urges for standardized communication procedures. Less use of telephone and more use of e-mail could cut costs.

Lilleborg (Oslo) - Ello (Kristiansund). When comparing empirics and theory this is a rather functioning communication channel with standardized processes. A better definition of roles could enhance external communication with other departments.

Ello (Kristiansund) - Lilleborg (Shanghai). Here are possibilities of improvements, e.g. if to follow the structure that Van Wheel provides a more efficient procedure can be created. The proposed well defined purchasing system can reduce the stress level of employees and decrease the number of misconceptions. There are also need to clarify product specifications and increase the use of handshaking e.g. reply and confirm all communication.

Ello (Kristiansund) - Sourced production (Shanghai). This is a communication link that could be removed and pushed inside Lilleborg if procurement in Shanghai would gain proper knowledge. If so, procurement in Shanghai could interact with the sourced production facilities in China and with knowledge of Chinese culture and short geographical distance create a more efficient communication.

Lilleborg (Shanghai) - Sourced production (Shanghai). This is a communication channel that could be intensified due to cost advantages compared to international communication, e.g. more face-to-face and in best case an implementation of a production system. The latter require investments though.

Discussing Lilleborg's communication in the light of the theoretical contribution there is a need of standardized processes. It is also clear that Lilleborg needs to establish explicit roles for parts and officials to decrease the number of interactions.

5.2.3 Transportation

The current transportation system is adequate and runs satisfactorily. To have a shipping agent in Shanghai that is responsible for the transportation between suppliers and port of loading is common and effective. Flexibility is enhanced by using road as a transport form in China and since the distance between supplier and port typically is short the heavy duties and fees connected with road transportation can be ignored. When transporting goods from China to Norway the decision to use transportation by water is optimal due to large capacity and relatively low costs. Consequently no major changes need to be done considering transportation form in China or between China and Norway since the current system is sufficient and optimal according to both theory and experts.

The current transport system might be sufficient and forms adequate but effort must be made to understand and investigate the underlying variables that should determine the frequency and intensity in the transportation system. At this time ordered quantities are based on how many components that fit into one container and the shipping agent picks up the components, fills the container and drops it at the port of loading when it is full. The frequency in the transportation system is hence dependent of how quickly the supplier can fill the container and at what date the container needs to be in Norway. Maybe a more efficient transportation system could be achieved by creating a simulation model and an optimization model. By calculating on different scenarios for a transportation model based on empirical data, a suitable solution can be provided, a solution regarding transportation frequency that is not dependent on when a container is full. Maybe

it turns out to be more efficient e.g. to order larger quantities and reduce the number of shipments or to ship containers more frequently and even if they are not full.

It is however of utmost importance to consider whether it is most cost- efficient to palletize components in China or in Norway, regarding time, shipping costs and wage rates. To use space efficient pallet racks and palletize the components before shipping can save both time and money for Lilleborg and by considering putting components in container directly after production an unnecessary packaging step can be eliminated.

5.3 Quality

Quality control is currently performed both at the Chinese production site and at the site in Kristiansund. Controls at the Chinese suppliers are conducted in the production process by workers at the site and by Lilleborg's representatives. The frequency and scope of quality control must be intensified, especially the ones conducted at the Chinese supplier.

Focus on quality controls early in the production process is of great importance since the earlier a quality error is detected the better. Every step in the production process adds value and it is a waste of resources to add extra value to a product that later needs to be scrapped. By improving quality control at the Chinese production sites savings can be made by detecting quality errors earlier in the process as well as increasing the possibilities that only high quality components are sent to Kristiansund.

Quality controls serve as a mean to secure high quality but the objective is to establish productions sites that only produce zero-fault components from the beginning, and as a consequence the number of expensive quality controls can be reduced. To establish a zero-fault culture it is of utmost importance to create commitment and understanding amongst the Chinese suppliers since Chinese manufacturers tend to have a slightly more relaxed view of quality in the production process. By developing instruction videos in Chinese and pedagogically visual aids, quality can be enhanced but most important for Lilleborg is to be integrated in the process, setting guidelines and being involved in the implementation of a production processes and quality systems. To involve Chinese suppliers in the creation of quality control manuals and quality plans a greater understanding of Lilleborg's high quality requirements can be achieved. In addition Lilleborg can invite Chinese suppliers to the plant in Kristiansund so they can see how important it is to fulfill quality requirements and which consequences incorrect components can have for the entire production process.

Quality problems are most often connected to the production of test batches and prototypes, and as a consequence it is often time consuming to involve Chinese suppliers in the development process. Since it is critical to reduce the time to market, the current process needs to be reengineered. Developing the prototype and final specification in cooperation with a local manufacturer shortens time to market and eliminates communication problems and unnecessary freight costs. However, if Lilleborg decides to continue involving Chinese suppliers in the development process it is critical that they find and use high quality tools and enhance communication as well as quality controls and production processes, by being much more involved and present.

Reduced time to market and more efficient communication can be achieved by letting the manufacturers send a small sample of components by mail to Kristiansund. Getting a component approved before sending the container reduces the risk of paying unnecessary freight costs. To send real samples is best since it is difficult to see and study circular objects on photography.

It is central that the procedures for the quality controls are investigated and fixed to eliminate misunderstandings and quality problems. By having standardized routines efficient controls can be conducted by employees at the site during the outbound logistics phase by Lilleborg's representative or by a 3rd party.

Finally, it is costly to keep tight tolerances and Lilleborg should consider whether the various measurements are relevant or not when creating a specification. By making the plant more flexible considering allowance of greater tolerances the production process can be smoother and the number of stops and the number of products that need to be scrapped can be reduced. Even the production process in China might be more cost efficient and less time and money have to be spent on precise quality controls.

5.4 Supply Chain Management

Supply chain management (SCM) is all about integrating each step in the supply chain into one large system and to manage assets across the entire chain. Lilleborg is well aware of the definition of SCM but actions must be taken to de facto pinpoint and conduct improvements to establish a more efficient and well-working chain.

Currently fluctuations in demand from Lilleborg makes it hard for the production site in Kristiansund to formulate an accurate production plan and as an outcome neither production nor organization is optimized. Extra shifts are hard to fill and hence it is sometimes problematic for the plant to meet suddenly raised demands from Lilleborg. Changing demands create changes in the production plan and the

number of costly set-ups increase alongside with the number of unfavorable batch sizes. If the number of set-ups or the duration of a single set-up could be decreased the total output of the plant in Kristiansund could be enhanced, a result that would benefit Lilleborg in many ways. The plant in Kristiansund must be seen as an important player in the supply chain and Lilleborg must take into consideration the unnecessary costs and problems that lack of information and rapid changes in demand cause. Lilleborg must acknowledge not only the benefits of flexibility but the costs of a diminishing production rate and the risk of scarcity.

By letting the production site in Kristiansund produce and send optimal batch sizes of products to the warehouse in Oslo, Lilleborg can improve their response to change and at the same time optimize the production process. Lilleborg will meet their customers' demand by focusing on keeping the right products in stock, or maybe larger volumes of them.

To manage the assets across the supply chain and identify where to reduce costs and how to improve response to change are of utmost importance for Lilleborg. By involving the site in Kristiansund as well as the suppliers in Shanghai the objectives for the supply chain can be determined as well as the activity requirements to match the objectives. The cost structure of these activities should be analyzed and Lilleborg must see the different stages and activities as a part in a larger system and not be afraid to manage assets across the supply chain.

6. Recommendations

This chapter presents a discussion of the specifics of Lilleborg's supply chain of sourced production. The empirical and theoretical additions in this chapter concerns specific details that affect possible recommendations. Current problems and opportunities are presented and suggested actions are discussed. Further are consequences and benefits of the recommendations analyzed and finally a concluding table is presented.

The final part of the fifth step in the tower of theory is presented in this chapter, see figure 13.

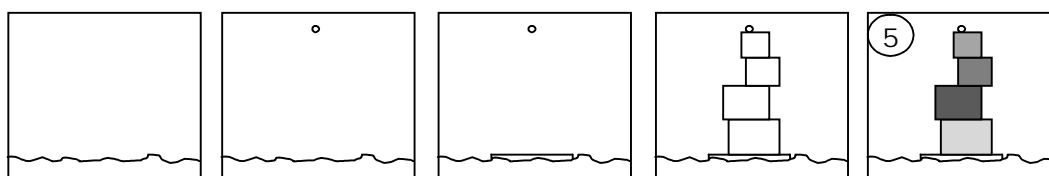


Figure 13: An illustration showing the step conducted in this chapter

The suggested recommendations are chosen in regard of the previous identified objectives of the supply chain optimization; cost efficiency, improvement of processes and quality enhancements.

6.1 Business Culture

In Lilleborg's engagement there is evidence of several problems linked to the issue of different business cultures. In more specific terms the most evident problems can be listed as follows; lack of understanding for cultural differences, contending perception of written agreements, different views of the value of personal impact on business relations, incoherent power distance and different views of hierarchical structures.

By merging aspects of theory and empiric recommendations these problems can be addressed and avoided. Solutions could be divided into two different tools of engagement; education and more frequent face-to-face meetings early in new formed relations.

Education could be performed in many different ways and the main objectives are to widen the participants' minds and increase their understanding of differences. A common way of educating is lecturing, this through either officials at Lilleborg, experts from the industry or the academic world. A more modern way of education is team-based exercises where cross-cultural teams are formed to solve

problems with interaction. The latter form of education enables the participants to watch actual actions instead of learning them through a third party.

When deciding upon which measure of education to use a critical issue is the cost of the investment versus the return. Since there is knowledge within Lilleborg of both Chinese and western culture an outside expert is regarded unnecessary. Lilleborg has already purchased literature concerning Chinese culture that the employees are to read at their own initiative²¹⁶. If Lilleborg should complement this literature with lecturing from officials within the organization, the knowledge might actually come to use. Further, enhancing the interaction with face-to-face team-based case exercises early in new relations will improve the collaboration even more. Finally including parts of forming and understanding written agreements could also enhance relations.

The expenses for travels and accommodation are the biggest concerns when performing face-to-face activities. An estimated cost of X NOK per person in travel expenses between China and Norway, additional X NOK per person and per night for accommodation can be seen as a sufficient estimation²¹⁷. This has to be compared with the cost of e.g. delivery failures regarding the components manufactured in China that have resulted in losses of X NOK and X NOK on per occasion²¹⁸. At a first glance it seems to be too expensive to arrange face-to-face educations, but when assuming that the delivery failures could happen again the initial investment in a team-based education should pay-off. This becomes more evident when regarding other parts of Lilleborg's manufacturing in China where a delivery failure resulted in a X NOK single event expense²¹⁹.

In addition to an initial team-based face-to-face education further lectures could be performed separately with officials at each location, improving understanding and avoiding the high costs of travel and accommodation.

6.2 Logistics

Problems concerning logistics could be concentrated to one single issue; the occasions of delivery failures. These failures are costly to Lilleborg and it is challenging to obtain delivery security when dealing with offshore sourcing together with a delivery guarantee of 99 %, which is the case for Lilleborg. With occasions of delivery failure in mind several areas of possible improvements were identified and appropriate solutions were investigated.

²¹⁶ Business developer, Lilleborg, 20080417

²¹⁷ Business developer, Lilleborg, 20080417

²¹⁸ Business developer, Lilleborg, 20080417

²¹⁹ Business developer, Lilleborg, 20080417

Deriving specifics from the discussion in chapter 5.2 and in regard of the theoretical recommendations, the following problem areas were identified; repackaging in Oslo, no warehouse to store components in China, stretched production in Kristiansund, ambiguous role definitions, inefficient communication, uninvestigated frequency of transports and finally that components are not directly loaded in container at Chinese supplier.

The repackaging procedure in Oslo exists due to the fact that Lilleborg has chosen to transport the components from China to Norway without palletizing the components. The motivation for this is the improved utilization of transport space when not using pallets in the container. Since the price of transports would not change if the repackaging was eliminated²²⁰ the savings to be made rests in the possible decrease in time to market that could be achieved. One solution could be to palletize in China directly at the supplier. This would decrease time to market although it would result in approximately a loss of X in transport space²²¹ which hardly makes this solution cost efficient. Another alternative would be to avoid pallets during the whole transportation. Unfortunately the production facility in Kristiansund has difficulties receiving the components if they are not on pallets²²². These findings conclude that existing procedure should be kept as it is.

A warehouse in China, storing components before shipment, would allow quality control in China. At present day this solution however requires a large investment and/or high cost of operations due to rent, salaries and cost of storage. Several empirical findings suggest no establishment of a new warehouse due to insufficient volumes of components. Evidence also suggests that quality control should be performed at an earlier stage in the supply chain.

During several interviews it became clear that the production in Kristiansund is not running adequately. It suffers from short series and several time consuming set-ups in the production. To relieve the production a readiness/safety storage could be established in Kristiansund but currently there is no available space for this²²³. Another alternative that was discarded was the recommendation of having increased storage levels in Oslo. Due to lack of space and high cost of rent for additional space, the proposal was scrapped.²²⁴ The recommendation rests in further investigation of the production processes in Kristiansund. There are evidence of an annual X different set-ups in production, each representing an average of X hours work and a loss of production capacity of about X-X

²²⁰ Procurement, Kristiansund, 20080417

²²¹ Procurement, Kristiansund, 20080417

²²² Procurement, Kristiansund, 20080417

²²³ Procurement, Kristiansund, 20080417

²²⁴ Logistics, Lilleborg 20080417

components²²⁵. The argument of investigation is further supported by significant literature on the subject. In "Manufacturing strategy" Terry Hill states that it is vital to integrate the manufacturing processes with the marketing processes.²²⁶ Though Lilleborg regards the production facility in Kristiansund as a separate entity, its processes' effectiveness highly affect the performance of Lilleborg and both parts would benefit through a better integration.

When Lilleborg is handling the sourced production from China in Kristiansund they have no clear responsibilities for different participants. There are findings from interviews that officials in China do not know who to contact in Norway and vice versa. The theoretical framework clearly states this as a prerequisite when addressing offshore sourcing. As for now the business developer has the overall responsibility and consequently has to put across participants to the right address, which strains his actual commitments. Recommendations are to define and document every role engaging the process of sourcing products from China. Further, include this material in the education proposed when dealing with cultural problems in chapter 6.1. A process such as this should not be very costly but in some way time consuming²²⁷. Alternatives are to divide the responsibility, hire personnel or to hire consultants. The latter two however increase expenses. A reasonable suggestion would be to merge the business developer with the China group²²⁸ in Lilleborg during a conjoint brainstorming session. The recommendation is cost efficient and the objective is to relieve officials work load and speed up both the development process and the sourcing process.

Additional issues of importance are the inefficient communication, findings of frustration and confusion which stress the need of standardized procedures. Communication standardization relies in definition of communication tools, guidelines of when to communicate and what to communicate. If including the process of standardizing the communication with the conjoint sessions with the business developer and the China group this would only require a minor investment. Examples of simple standardization measures would be the defining of e-mail procedures. E-mail is a cost efficient and quick way of communicating but if not properly used it poses a major risk of misinterpretations. In Figure 14 an example of a standardized e-mail is proposed. It follows a few simple rules;

- Only one issue per e-mail.

²²⁵ Technical Officer, Kristiansund, 20080417

²²⁶ Hill (2000) p. 30

²²⁷ Business developer, Lilleborg, 20080417

²²⁸ A set of officials at Lilleborg who outside their normal assignments should work together to improve collaboration with China.

- State in the header; a noun followed by a verb, a time and finally a priority.
- The body should follow the same structure as the header although with more information.
- Always use handshaking, which implies the requirement of replying all e-mails sent to you.

Subject:	Order of plastic caps, manufacture 10000 , needed 20080720, High
From:	john.doe@lilleborg.no
To:	john.doe@lilleborg.no
Body:	<p>Want to order Plastic caps</p> <p>They need to be in Oslo before 20080720</p> <p>This order has High priority</p> <p>Will you be able to deliver 10000 Plastic caps to Oslo before 20080720?</p>

Figure 14: An example of a standardized e-mail

As for now the expenses for telephone conversations with China are approximately X NOK per year for the business developer.²²⁹ Telephone conversations are often used in the beginning of relations since there might be some risks of misunderstandings when using other communication tools but after initial contact is established other more cost efficient alternatives should be used. Telephone costs are an example of a direct expense that could be decreased with increased use of other means such as e-mail, Skype or MSN (both web-based communication tools) and at the same time using standardized communication procedures. Another method is the use of video conferences, which unfortunately at present date has limited possibilities. This is due to lack of technical equipment in China²³⁰.

When Lilleborg order sourced components the transportation of these has always relied on the assumption that filled containers is least expensive. This consequently makes it a possible area of improvement, it has not been investigated, but in need of further investigation before any proper actions are taken.

²²⁹ Business developer, Lilleborg, 20080417

²³⁰ Business developer, Lilleborg, 20080417

There could be some time saved if the components could be loaded directly into the container at the Chinese supplier. This requires having a container at the supplier during the production process. Depending on the method of payment different costs are carried. If payment is performed afterwards e.g. after 45 days there is no direct cost, but if payment are made before shipment Lilleborg may pay an interest of about X of the value of the container²³¹. Because of the lack of information of how much time that could be saved Lilleborg is recommended to further investigate this issue before making any substantial changes.

6.3 Quality

A number of issues concerning the supply chain for sourced production in the case of Lilleborg affects the quality of the components. Observations made show a process that functions rather well when up and running but during start-ups and development there are several problems. These problems often prolong the processes and create confusion.

The problems concerning quality can be shown through the following list; different views on necessary quality requirements within the organization and with suppliers, different view on how to improve quality, insufficient quality control, difficulties for suppliers to deliver components that fulfill specification, high uncertainties regarding tools, quality and transport damages, inefficient product development and specification setting, approval of test batches can sometimes be a long and expensive process.

The different views on quality is best met by communication and education. This is a third element that could be integrated in the previous mentioned recommendation of education within Lilleborg in chapter 6.1, which adds up to conducting education over views of quality, communication, role definitions and cultural differences. A more challenging task will be to inform the suppliers. Three ways of doing this is to either; create information material and send it to suppliers, visit suppliers and inform at the production facility or to invite representatives of the suppliers to the office in Shanghai. The most expensive solution would be to invite the suppliers, e.g. the cost of transports and need of hiring appropriate meeting rooms²³². To send material would be cost efficient but not as effective as personal meetings. Lilleborg is recommended to visit the suppliers and with appropriate materials inform the suppliers of their values and view of quality.

²³¹ Procurement, Shanghai, 20080417

²³² Business developer, Lilleborg, 20080417

The issue of improving quality is linked with the different views on quality. Again an appropriate solution would be to add this part to already recommended educational events. In this case it is important to add the parts to the early face-to-face teamwork assignments addressed in chapter 6.1. This in addition to already proposed solutions will not imply any major costs but some extra educational material and time is required.

In Lilleborg's present activities of sourced production there are evidences on lacking quality control. As previously mentioned there have been events of increased costs, see chapter 4.4 and 6.1, due to inadequate quality on components and suppliers' inability to deliver components according to specification. Empirics and theory both support an approach of performing quality control as early as possible in the supply chain. It is recommended that Lilleborg visits the suppliers often and review quality control and specifications. Today this is one of the responsibilities of procurement in Shanghai but it is not working at satisfactory. Due to the amount of about X orders per year it should be possible to even visit the suppliers during every single order and perform quality control both in production and during the outbound logistics phase. Combining this solution with standardized specifications intensively communicated through the officials from the Lilleborg's office in Shanghai an efficient process will be achieved.

Example of what a standardized quality control manual could include is found in chapter 3.6. This process could be intensified with educational material of e.g. instruction videos. The necessary cost following this recommendation would be traveling expenses and the time of Lilleborg's employees. Traveling costs is estimated to be X NOK per year for rental of a minivan²³³. One visit to a supplier would approximately imply one days work. As the situation is today for Lilleborg the officials in Shanghai do not have any resources or time to spare. This fact promotes a new hire of an employee in China dedicated to quality control and estimated costs of all expenses reaches about X NOK per year²³⁴. The responsibility for educating and defining the new employee's assignment would rely on quality control in Norway²³⁵. Compared to potential savings it is not evident that this investment will pay off directly but regarding Lilleborg's intentions of increased presence in China²³⁶ it is a strongly recommended action. A possible modification to the solution of hiring would be to use a third party. This would be less expensive in pay but more difficult to put across the values and objectives of Lilleborg hence not preferred.

²³³ Business developer, Lilleborg, 20080417

²³⁴ Business developer, Lilleborg, 20080417

²³⁵ Business developer, Lilleborg, 20080417

²³⁶ Business developer, Lilleborg, 20080417

The present specifications of components at Lilleborg are insufficient. This is supported by findings from interviews where there exist variations of quality²³⁷. When further comparing current specification used for quality control with theoretical proposals there are improvements to be made. From this argumentation several suggestions of proper actions concerning the specification used for quality control and the quality control procedures are presented.

One suggested way to enhance quality control directly during the production procedure is the pre-control. It relies on the assumption that of the total amount of produced components 86 % will stay within the pre-control lines concerning tolerances. The pre-control lines are drawn 1/4 from the actual tolerances, according to Figure 14.²³⁸

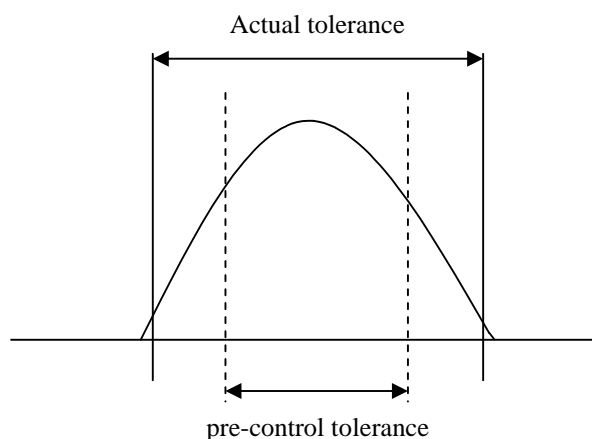


Figure 14. Image of the assumption underlying pre-control, own development based on Juran (1962)

From the assumption above some recommended actions during the production are taken, the following are the most significant; 1) If the component is outside the actual tolerance, reset and start over, 2) If the component is inside the actual tolerance but outside pre-control, check the next component, 3) If the second component is inside specification but outside pre-control, reset and start over.²³⁹

At the moment, the specification Lilleborg uses for quality control only covers some of the remarks on Juran's list over the recommended purposes a quality control manual should serve, see chapter 4.4. A more thorough work on a specific quality control manual should be done with the following additions and concerns in mind; a manual or specification is always interpreted and this has to be taken

²³⁷ Packaging, Lilleborg, 20080303

²³⁸ Juran (1962) section 19

²³⁹ Juran (1962) section 19

into account and either the printing should be clearer or a proper guidance of how to interpret the print has to be made.

Different uncertainties regarding the supply chain for sourced production has to be decreased. There are several factors that could affect the process in a negative way and to decrease their effect, uncertainties should be addressed. When choosing tools. E.g. there is a wide array of options with price spanning from a couple of X NOK to several X NOK and the level of quality is often correlated to the purchase price. To ensure a stable, low risk future process e.g. the purchase of tools should be carefully evaluated.

One major issue that emerged when gathering empirics was the tedious process of product development in collaboration with the Chinese suppliers, including approval of test batches. Findings show results of lacking standardization, different views and confused participants. A possible solution would be to involve a local supplier in Norway during development process. This is however difficult in Lilleborg's case due to many problems originating in test production which would imply expensive relations with the Norwegian supplier²⁴⁰. From this statement suggestions to Lilleborg are the following; standardize development process, define roles and decrease number of participants, send samples through mail from China to Norway, increase intensity of supplier relations during development. A well defined process is not particularly expensive and will relieve both the participants in the development process and decrease the time. Further it will ease future production because suppliers and Lilleborg employees get defined instructions and responsibilities. Sending samples through mail will take about 3-5 days with express²⁴¹. Real live samples are preferred since, mentioned in chapter 5.3, it is hard to determine quality of three dimensional components from images.

6.4 Supply Chain Management

When regarding the entire supply chain and the management of it there are areas in need of improvement. Several of the issues of business culture, logistics and quality could be addressed if investigating the supply chain as a whole. Interviews have shown that e.g. marketing at Lilleborg lacks understanding of costs and problems at the production facility in Kristiansund. There are also evidences from interviews and analyses that some possible actions overlap and could solve problems affecting more than one area. Dividing the supply chain management problems into three; insufficient integration between the different parts in the supply chain, investigation of supply chain issues have not been satisfactorily prioritized, inadequate transparency through the supply chain.

²⁴⁰ Business developer, Lilleborg, 20080417

²⁴¹ Business developer, Lilleborg, 20080417

Suggestions are to create a new responsibility within Lilleborg e.g. divided to a group of employees or to only one. This would imply working for increased communication of the objectives and values of Lilleborg, define responsibilities, investigating costs and to whom the cost are linked. There is a project at Lilleborg, just initialized, investigating the entire supply chain with the objective of 99 % delivery guarantee²⁴². These actions are vital due to present international market where companies do not compete with each other solely but entire supply chains do. In chapter 3.7 a proper step by step process is presented on how to enhance the supply chains performance.

6.5 Concluding Recommendations

Below a table of concluded recommendations for Lilleborg is presented. The table show major actions and recommendations, which areas and problems the suggested actions solve, cost of suggested actions and identified benefits.

Recommendations	Addressed problems	Costs	Benefits
Face-to-face teamwork assignments early in supplier and sourcing relations	<ul style="list-style-type: none"> -Lack of understanding for cultural differences -Contending perception of written agreements -Different view of the value of personal impact on business relations -Incoherent power distance and different views of hierarchical structures 	<ul style="list-style-type: none"> X NOK per person traveling to or from China plus X NOK per person and night of accommodation Alternative cost of employees participating in the assignments 	<ul style="list-style-type: none"> Decreased development time Reduced costs of telephone conversations Reduced time to market
Internal education within Lilleborg	<ul style="list-style-type: none"> -Lack of understanding for cultural differences -Contending perception of written agreements -Different view of the value of personal impact on business relations -Incoherent power distance and different views of hierarchical structures 	<ul style="list-style-type: none"> Alternative cost of employees participating in the assignments 	<ul style="list-style-type: none"> Reduced costs of telephone conversations Reduced time to market

²⁴² Logistics, Lilleborg, 20080417

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Recommendations	Addressed problems	Costs	Benefits
Investigation of production in Kristiansund	-Stretched production in Kristiansund	Cost of external consultants or alternative cost of employees investigating	Higher delivery capacity avoiding fines and unsatisfied clients
Group exercises to define roles and communication procedures for the sourced production process	-Inefficient communication -Ambiguous role definitions	Alternative cost of the employees in the China group and the business developer	Reduced costs of telephone conversations Reduced time to market
Investigation of the frequency of transports	-Possibility of imperfect frequency of transports	Cost of external consultants or alternative cost of employees investigating	Possible decrease in avoidable costs per order
Investigation of the opportunity to fill containers directly at the supplier	-Possibility of unnecessary storage and loading time at supplier	Alternative cost of employees in China investigating	Possible decrease of time to market
Visit the supplier with informative material	-Different views on necessary quality requirements within the organization and with suppliers -Different view on how to improve quality -Difficulties for suppliers to deliver components that fulfill specification	X NOK per year in traveling expenses Alternative cost of an employee in China for a day	Decreased development time
Hire an employee responsible for quality control in China -Frequent visits at supplier -Evaluating suppliers and quality in China	-Different views on necessary quality requirements within the organization and with suppliers -Different view on how to improve quality -Insufficient quality control -Difficulties for suppliers to deliver components that fulfill specification -High uncertainties regarding tools, quality and transport damages	X NOK per year X NOK per year in traveling expenses (could be merged with the above solution) Alternative cost of quality control in Norway for defining the role of the new hire	Possible savings of X-X NOK per year due to better quality of components Decreasing the risk of even higher costs due to lacking quality of components Decrease of time to market

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Recommendations	Addressed problems	Costs	Benefits
Define development process, test batch procedures and responsibilities	<ul style="list-style-type: none"> -Ambiguous role definitions -Difficulties for suppliers to deliver components that fulfill specification -Inefficient product development and specification setting -Approval of test batches can sometimes be a long and expensive process 	Alternative cost of the employees in the China group and the business developer	Decreased development time
Send test samples through mail from China to Norway	<ul style="list-style-type: none"> -Approval of test batches can sometimes be a long and expensive process 	X NOK per in present cost of use, marginal difference if deciding to send e.g. one sample per test production	Decreased development time
Investigation of the entire supply chain as a whole, involving every affected part e.g. marketing and sales	<ul style="list-style-type: none"> -Insufficient integration between the different parts in the supply chain -Investigation of supply chain issues have not been satisfactorily prioritized -Inadequate transparency through the supply chain 	Project already underway, suggested increased intensity will increase cost	Higher delivery capacity avoiding fines and unsatisfied clients

7. Conclusions

In this last and final chapter the fulfillment on this thesis's purpose is discussed and general as well as case-specific conclusions are presented. Lastly are relevant areas of further research discussed.

The purpose of this thesis is to investigate and propose how supply chain optimization for sourced production should be addressed and to achieve practical relevance a case study of Lilleborg's supply chain has been conducted. As a mean to answer the research question a methodological framework focusing on theoretical as well as practical relevance have been created and applied in the study. The framework, the tower of theory, is a methodological contribution that enhances the process for optimizing supply chains and by following the five steps adequate conclusions and recommendations can be drawn.

Initially delimitations of the context of the problem must be set and from the relevant context and practical issue the objectives with the supply chain enhancements should be discussed and declared. By building a theoretical foundation and framework relevant for addressing the stated objectives the researcher can identify what appropriate empirics that needs to be gathered. When filling the different empty theoretical boxes in the framework with relevant empirics, an analysis can be made from combining theory and practical information. From this analysis, conclusions can be drawn and recommendations considering both theory components and practical components can be generated. By applying a framework that consists of empirics and several relevant theories that form a cohesive and coherent tower towards previously set objectives is the optimal strategic behavior for optimizing a supply chain according to this study. Thus the methodological framework can be used for supply chain optimization but it is critical to stress that the tower of theory can be seen as a generic model for a sufficient methodological approach when investigating issues that require integration of theoretical as well as practical components. The work process when applying the framework can be regarded as fixed and generic while the context, objectives, relevant theories and empirics vary and are case specific.

When conducting the proposed strategic behavior and applying the tower of theory in the case study a number of adequate recommendations based on the analysis of relevant theories and empirics could be generated. By de facto implementing the recommendations presented in this thesis, the set objectives, cost efficiency, improvement of processes and quality enhancements, can be met.

A number of problem areas related to Business Culture, Logistics, Quality and Supply Chain Management have been identified and recommendations on how to improve the current situation have been generated.

Problems associated with business culture are e.g. lack of understanding for cultural differences, contending perception of written agreements, different views of the value of personal impact on business relations and incoherent power distance and different views of hierarchical structures. By introducing face-to-face teamwork assignments early in supplier and sourcing relations and focusing on internal education within Lilleborg these problems could be eliminated.

Regarding logistics, inefficient communication processes, lack of standardization and ambiguous role definitions have been identified as the main problem areas. To overcome these problems we recommend group exercises to define roles and communication procedures for the sourced production process.

Quality related problems can be summarized in the following way; different views on necessary quality requirements within the organization and with suppliers, different views on how to improve quality, difficulties for suppliers to deliver components that fulfill specification and insufficient quality controls. To overcome these problems a number of recommendations have been generated, e.g. visiting the supplier with informative material and hire an employee responsible for quality control in China.

A number of problems linked to supply chain management have been acknowledged, e.g. inefficient product development and specification setting, insufficient integration between the different parts in the supply chain and investigation of supply chain issues have not been satisfactorily prioritized. By defining development process, test batch procedures and responsibilities better and sending test samples through mail from China to Norway, the performance of the supply chain can be enhanced. To improve the performance further an investigation of the entire supply chain as a whole, involving every affected part e.g. marketing and sales needs to be conducted.

Several areas of further research have been identified and for Lilleborg additional and throughout studies and investigations of the entire supply chain can be seen as relevant as well as conduction of studies focusing on the relationship between the plant in Kristiansund and Lilleborg. Areas of attention should be the correlation between Lilleborg's forecasts, requirements and changes in demand and the plant's costs and output of products.

Finally, non case specific areas of necessary further research are to investigate the impact of communication processes and cultural differences when sourcing from other countries.

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Oral

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Expert Robert Linderoth	2008-03-17	Face to face
Expert Charlotta Johnsson	2008-03-11	Face to face
Expert Knud Midtgaard	2008-03-11	Telephone

Appendix 1

	Quality	Logistics in China	Shipping	Adm. In China	Plant China	Plant Norway	Warehouse	Communication
Business Dev.		X	X	X	X		X	X
Quality C. Lilleborg	X							
Quality C. Krist.	X					X		
Tech. Officer Krist.						X	X	
Procurement Krist.						X		
Logistics Lilleborg		X	X					X
Sourcing Director					X		X	
CEO			X					
Packaging	X							
Procurement Shang.		X	X	X	X			
Chief Rep. Shang.			X	X			X	
Marie Lange	X						X	X
Robert Linderoth		X	X				X	
Charlotta Johnsson	X	X					X	X
Knud Midtgaard	X	X					X	X

Appendix 2

Postal address: Office address: Telephone Den norske Bank:
Lilleborg as Byttestein 1 +47 71 56 56 00 [REDACTED]
Dep. of Ello N-6517 Kristiansund Telefax:
N-6504 Kristiansund THE ORKLA GROUP AS +47 71 58 28 17



Fax nr:
Tlf. nr:

Purchase order Nr. [REDACTED]

Above No. to appear on all documents.

Invoice address:
Lilleborg AS
c/o Fakturamottak
PB 4370 Vika
8608 MO I RANA
Norway

Suppliers No. [REDACTED]

Kristiansund, 05.02.2008

Your ref

Terms of delivery and payment

Terms del. : [REDACTED]
Terms payt. : [REDACTED]

Delivery/Validity date

Delivery date [REDACTED]

Delivery address

Our factory, Byttestein 1, Løkkemyra, 6517 Kristiansund.
Opening hours 07:00 - 22:00.

We order according to below specification and to our conditions of purchase.

NB!! Do to increased demand this order hjas to be sent by air.

Each carton to be marked with:
Quantity, our article no. and order no.

Goods, invoice and shipping papers to be marked with:
Our article no. and order no.

We await your order acknowledgement within 14 days.

Item	Material	Description	Price / Unit	Date of arrival	Net value
	Order Qty.	Unit			

Yours faithfully
for LILLEBORG as

B. J. Haukenes
Eivind Haukenes

Appendix 3



INSPECTION REPORT

1 GENERAL

Item	Jif Duster Kit	Report no.	
Buyer	Lilleborg	Production date	
Lot no.		Tester	
Quantity	100 Duster Handles 50 Consumer Units (blister) 25 Trade Units (outer box)	Report date	

Sampling: 100 Duster Handles / 50 Consumer Units (blister) / 25 Trade Units (outer box)

Test method: As described in specification.

Results: Number of requirement deviations.

2 DUSTER HANDLE APPEARANCE

Parameter	Requirement	Results	Signature
Cleanness	Free of dust, dirt, grease or foreign materials (or malodours)		
Colour	According to samples		
Parting line TPE grip and ABS core	Clean and even parting line. No shavings.		
Sink marks	Even surfaces		

3 DUSTER HANDLE DIMENSIONS

Parameter	Requirement	Results	Signature
Snap mechanism, pins in folded position	The pins must stay in folded position (parallel to grip).		
The three different positions: folded, unfolded and angled.	Tight fitting in locked position.		
Knob	The knob must slide smooth.		
Attachment to Jif Mop pole: Attaching / detaching force			
Attachment to Jif Mop pole: Minimum torque force			
Batch number on all plastic components	Correct production date (year, month)		
Parallel pins			

4 DUSTER REFILL APPEARANCE

Parameter	Requirement	Results	Signature
Colour	White		
Dirt/dust	Absent		

5 PACKAGING

Parameter	Requirement	Results	Signature
Graphics/colour	According to approved standard samples: Backing card, insert label, tray and hood.		
Cleanness	Free of dust, dirt, grease or foreign materials (or malodours)		
Perforation on backing card	Easy to open		
Sealing (blister and backing card)	Properly sealed: Completely tight. No gaps. No		
Transparency of blister	Transparent, no scratches		
EAN bar code	Complete readability (GS1)		
Batch number	Present and readable		
Hood length			
Hood width			
Hood height			

6 APPROVAL