Compilation of sourcing model based on supplier selection criteria

- A case study at Ellos

Master of Science Thesis
in the Supply Chain Management master's Programme

GLORIA MATUKA
SOFIE NILSSON
SABA TALIMY

Department of Technology Management and Economics
Division of Logistics and Transportation
CHALMERS UNIVERSITY OF TECHNOLOGY
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GLORIA MATUKA
SOFIE NILSSON
SABA TALIMY

Examiner: Mats Johansson
Tutor, Ellos: Lars Sandell

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

Chalmers Reproservice
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Abstract

Increased globalisation has enabled companies to source for material in various ways, creating a variety of sourcing strategies. It is a challenge to obtain a supplier that can provide the right products to the right cost, at the right quantity and quality, at the right time. In a quest for lower cost, many companies choose to source in the far east which in turn leads to longer lead times, more insecurity with transportation and planning making it more difficult to achieve the right product, at the right cost, time and quantity. The purchasing department usually has to deal with these challenges, which many times are conflicting, a lower and desirable purchasing price may result in too longer lead times when selecting suppliers and a trade-off is needed. In order to obtain the right supplier, there are varieties of methods that can be used during the supplier selection that place selection criteria into consideration in order to attain the company's selection needs. Companies are usually focused on cost and although it is an important factor, it is important to incorporate other factors especially in the fashion market that is fast changing. Supplier selection is an essential activity that is not well studied within the fashion industry. This thesis serves as an example of utilizing quantitative and qualitative factors when evaluating suppliers. It could be of good value for companies that are interested in shifting their supply source.

The purpose of this thesis has been to investigate selection criteria for supplier selection and develop a sourcing model for the selection of suppliers for a Swedish home shopping and e-commerce company within apparel and home textile, Ellos. The developed sourcing model has been applied in a case study conducted at the current company for two identical products sourced from one supplier in Turkey respectively China. The sourcing model is of great importance for Ellos as their focus has been mainly on Cost of Goods Sold (COGS). Due to the cost focus Ellos has a major part of their supplier base located in low cost countries in East Asia. In order for Ellos to stay competitive on the market Ellos has to widen their focus and also include other criteria when evaluating suppliers. By doing so the most suitable choice can be obtained. This is also important to other companies for the same reasons due to the focus on lowering cost and not analysing the total cost within the supply chain.

The scope considered the clothing part at Ellos and the sourcing model was designed for this section of the company. The model was designed with the supplier selection criteria suited for Ellos own brand of clothing section. This scope was due to that the monetary value is largest within this area of Ellos Group.

The sourcing model that was established consists of both Total Cost of Ownership and Analytic Hierarchy Process. A combination of both models resulted in a cost and benefits diagram, compiling an overall combined view of the qualitative and quantitative factors regarding supplier options. The cost and benefits diagram shows that it is beneficial for Ellos to source locally, from Turkey, when it comes to the two fast fashion products.

Key words: *Supplier selection, Selection criteria, Analytical Hierarchy Process, Total Cost of Ownership*

Nomenclature

AHP: Analytical Hierarchy Process, a structured multi-attribute decision-making tool, based on both qualitative and quantitative categories for organizing and analysing complex selection decisions.

CI: Consistency Index, deviation or degree of consistency.

COGS: Cost of Goods Sold, represent the accumulation of the total costs in response to a specific product or service which has been offered and sold by a company. Included costs are directly tied to the production of the company's products.

CR: Consistency Ratio, a comparison between consistency index and random consistency index. CR=CI/RI. CR has to be smaller than or equal to 10% to represent an acceptable inconsistency. The smaller the CR value is, the better the measure of the data is.

DC: Distribution centre, is a warehouse for a temporarily storing of a retailer's goods, until they are transported to either its stores or directly to the company's customers.

RI: Random Consistency Index is an average CI for an extremely large amount of randomly generated matrices of the current order. A random index which represents the consistency of randomly generated pair-wise comparison matrix.

TCO: Total Cost of Ownership, a financial calculation intended to support buyers and owners to assess direct and indirect costs and benefits related to the purchase of either a product or service.

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1. Introduction

This chapter gives a background of the thesis and present the purpose, the research questions and the scope.

1.1. Background

Ellos is a Swedish company and one of Scandinavia's leading online retailers within apparel and home textile. Ellos is a part of the Ellos Group, forming the largest remote shopping marketplace for textiles and clothing. Ellos existing product portfolio consists of basic products, fashion products and carry forward products. Basic product are products that are sold throughout the year, fashion products are products that are launched two times a year, and carry forward products are seasonal products that are sold in a particular season i.e. either autumn-winter or spring-summer.

Ellos is in the process of launching a fast fashion collection which will be replacing fashion products in the already existing portfolio. The difference between fashion and fast fashion products is that the fast fashion products are launched more frequently during the year and are more limited in smaller quantities. This results in a switch of strategy towards several clothing collections, combined with the basic assortment that is available throughout the year and the carry forward assortment, instead of the two major collections previously offered. The reason for the new strategy is to be more competitive within the fast fashion market, and strengthen and renew the brand image. The switch of strategy does however require a faster response to the market, which involves a review of the company's supplier base in terms of the supplier relationship and work approach. A faster response for fast fashion products is required due to short product lifecycle (Mason-Jonas et al., 2000). A part of the reason to review the supplier base is to evaluate the supplier’s ability to meet up to the requirements of delivery precision meaning deliveries in the right time and quantity.

Fast fashion has emerged as a global trend and in order for companies to respond to this trend the supply chain needs to be highly responsive and be able to produce products in small quantities (Choi & Chiu, 2011). Increased globalization has made low cost countries attractive and accessible sources of supply which in turn affects sourcing strategies, e.g. global and local sourcing. With the purchasing function determining employed purchasing strategies, selecting the right supplier becomes crucial in terms of the obtained total cost and competitive advantage. (Van Weele, 2010) Supplier selection is typically done at a strategic level and decisions made at this level have a long term impact on the overall performance. Therefore, decisions should be made in a comprehensive manner. (Hongwei et al., 2004) According to Chopra & Meindl (2012) when assessing suppliers, it needs to be based on the impact the supplier has on the supply chain surplus and total cost. Unfortunately, the driving components behind sourcing decisions are often solely driven by the price charged by supplier (ibid).
During the supplier selection, criteria can be used to achieve right purchasing decisions. Those criteria’s can be qualitative, e.g. quality and lead times as well as quantitative, e.g. costs of goods sold (COGS). The quantitative criteria are tangible factors and can be counted

while qualitative criteria are intangible factors which need to be weighted. All these factors affect the total cost of the purchasing. (Tahriri et al., 2008)

Ellos current process of selecting suppliers is based on COGS, where the focus is in favour of other factors, which has resulted in a push influenced flow through the supply chain. Traditionally Ellos have bought large quantities partially due to supplier minimum order requirement, which has enabled a high service level towards customer by being able to offer the product at all time. However, the negative aspect is the financial losses in form of excess of products that has been attained. The long lead times have also been a crucial factor when placing orders. In addition, it has caused issues with excess of products from the large quantity of orders, creating high inventory costs and high discount rates to customers in order to sell of the excess. Excess inventory costs are typically high within the fashion industry due to the highly variable demand and the excess stock that is cleared at a lower price than the purchase cost (Karakul, 2008). The new strategy pronounced by Ellos to offer several limited collections and retain the basic collection would lead to a more pull influenced flow, thereby affecting the supplier base in order to be responsive to the market. It will no longer be motivated to purchase materials in large quantities to minimize costs, instead it becomes important to have suppliers that can meet the demands for short lead times, high flexibility and high delivery precision. To assist Ellos and support them in going from two major collections to several collections, a sourcing model for supplier selection that supports and considers more factors than solely cost is needed.

Over the course of year's sustainability has received more attention pressuring companies to incorporate it as a criteria when addressing suppliers (Mehregan et al., 2014). According to Caniato et al. (2004), apart from consumers being conscious of quality, price and style they have over the years developed an interest towards ethical consumption and products environmental impact making sustainability a stepping stone for companies that want to reach environmental conscious consumers. Additionally, it is a way for companies to enhance the overall company brand. Companies have a social responsibility in terms of child labour, health and social equity. With scandals that have reign within the fashion industry, companies are held accountable for social and environmental problems caused directly by them or their suppliers. Companies therefore need to take sustainability into consideration when selecting suppliers by having dimensions of sustainability incorporated into the selection criteria. (ibid)

The thesis serves as an example of combining quantitative and qualitative factors when evaluating suppliers. It could be of good value for companies that are interested in shifting their supply source. Furthermore, while conducting research studies, it is indicated by research that the supplier selection process is one of the most significant variables with a direct impact on the performance of a company (Bhutia & Phipon, 2012). The indirect and direct consequences that emerge from poor decision become more critical as companies become more dependent on their supplier (Ibid). Due to this a continuous development of methods for supplier selection may seem relevant as it has such an impact on a company.

1.2. Purpose

The purpose of the thesis is to identify selection criteria for supplier selection and develop a sourcing model for the selection of suppliers within the fast fashion area.

1.3. Research questions

Ellos wishes to reduce the focus from COGS, which is frequently used today and create a sourcing model, which also includes qualitative selection criteria. An analysis of criteria that affect sourcing is required in which those that are vital for Ellos when choosing suppliers will be included in the new sourcing model for supplier selection. This sourcing model should be used as guidance for when it is more beneficial to source globally or locally. According to Tahriri et al. (2008) determining criteria is the first step to creating a supplier rating procedure used to asses suppliers. A combination of literature and interviews will facilitate in the selection of criteria essential for Ellos. As the sourcing model should be able to handle both qualitative and quantitative factors, previous research within the field will facilitate with the selection of a sourcing model. Established research questions are to facilitate in the development of the sourcing model.

The following research question has been formulated to aid in the fulfilment of the purpose:

1. *What supplier selection criteria are appropriate for Ellos to use in the supplier selection process?*

2. *How should the selected selection criteria be weighted?*

3. *How can the selected selection criteria be applied in a suitable sourcing model?*

4. *When is it suitable to source locally (Turkey) or globally (China) for Ellos?*

1.4. Scope

The thesis will consider the woman's department for fashion clothing at Ellos and the sourcing model will be designed for this section of the company. This scope is due to that the woman's department is the largest monetary value within Ellos. Ellos sells both their own and other brands through the e-shopping, however their catalogue only offers products of their own brand. The model will be designed with the supplier selection criteria suited for Ellos own brand of clothing section. A model for supplier selection will be developed and later established by Ellos. The model is a simplified mathematical model that weighs criteria amongst different suppliers.

The case will cover a study of two similar products that have been sourced from China and Turkey. A comparison will be done of the suppliers to weigh the advantages and disadvantages from local and global sourcing for the fast fashion orientation within Ellos. For this, supplier selection criteria will be identified, all cost factors for the two products both before as well as after the distribution centre (DC) will be examined, and a simplified mathematical model for supplier selection will be developed. The thesis will in short analyse the advantages and disadvantages with supplier selection for Ellos by comparing a supplier

from Turkey with a supplier in China based on the developed sourcing model for supplier selection process. The selected suppliers for the case study are established suppliers within Ellos supplier base.

1.5. Disposition

Chapter 1: Introduction
Chapter one presents the background, the purpose, the scope and the research questions.

Chapter 2: Theoretical framework
Chapter two describes and define the key concepts used in the thesis and lay the foundation of the theory used in the analysis and discussion, i.e. sourcing strategies, purchasing process, supplier selection methods and supplier selection criteria.

Chapter 3: Methodology
Chapter three presents the methodology used in the thesis. The study design and the work process is presented and the methods conducted to collect and analyse data are described. The section ends by discussing the validity and reliability of the research.

Chapter 4: Empirical findings
Chapter four presents the case company and the data collected. The quantitative and qualitative data is presented separately; qualitative data is based on interviews and quantitative data is historical data from sourced products.

Chapter 5: Development of sourcing model
Chapter five analyse the empirical data and answer the research questions at hand.

Chapter 6: Discussion
Chapter six discusses the key findings by relating them to previous literature. It also discusses the contribution of the thesis and gives suggestions for further research.

Chapter 7: Conclusion
Chapter seven concludes the thesis and gives some managerial implications.

2. Theoretical framework

The theoretical framework aims at describing and defining key concepts and lay the foundation for the theory used in the analysis. It starts by examining sourcing strategies, the importance of adapting supply chain strategies to the unique context of the company and describes benefits and risks of different sourcing strategies. Thereafter the purchasing process, supplier selection and supplier selection criteria are presented. Last in the chapter different methods for supplier selection are discussed.

2.1. Sourcing strategies

According to Van Weele (2010) sourcing strategies refers to the amount of supplier a company utilise for respective commodity, the characteristics of the relationship between parties involved and the type of contract that has been negotiated. There are two types of exchange that distinguish the supplier-buyer relationship; transactional exchange and relational exchange. The transactional exchange has a distinct beginning and end and is usually short-term (Svahn & Westerlund, 2009). The transaction cost is dependent on three factors: the frequency of the transaction, the level of the transaction-specific investments and the internal and external uncertainty (Van Weele, 2010). Relational exchange is more long term as it aims towards co-operation between the parties. Furthermore, it lays ground for innovation, as it would have a more collaborative nature in the relationship. The success of this form of exchange is dependent on the quality of the relationship and the resources of the supplier. However, most supply markets show few signs of being real markets because there are fewer available suppliers in actual sense. (Svahn & Westerlund, 2009)

Besides deciding the type of relationship, a company needs to determine whether they should reduce, expand or maintain the supplier base. Evaluating the supplier base is conducted in order to conclude that both the right number of suppliers and the right suppliers are utilised. This requires an identification of current and potential suppliers for each category and the cost. Apart from evaluating the supplier base a company needs to determine a sourcing strategy, single/multiple source or source globally/locally. (Van Weele, 2010) Single/multiple sourcing indicates that a commodity is sourced from a single supplier or multiple suppliers, the sourced commodity may be sourced locally or globally thereof local/global sourcing.

When determining sourcing strategies, sustainability is a considered aspect that is included in the conclusive decision. This is due to the increased transparency that companies are expected to have. Suppliers are an important part of a company´s value chain, as a social or environmental scandal could ruin the reputation of a company caused by the company itself or the suppliers. Thus, companies incorporate suppliers into their sustainability program nowadays. (Van Weele, 2010) Sustainability is a broad subject that is divided into three aspects: social equity, economic growth and the environmental impact. The social principle requires everyone to be treated fairly and equitably. The economic principle requires adequate

production of resources in order to maintain standard living and finally the environmental principle requiring society to protect its environmental resources. (Caniato et al, 2004)

2.1.1. Lean and agile supply chains

A company does not compete against other companies instead whole supply chains are competing against other supply chains (Jüttner et al., 2007). According to Christopher (2005) Supply Chain Management (SCM) is, "the management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole". There is material, information and financial flow between the different parties. SCM is closely linked with logistics. However, the supply chain is not as simple and plain as a chain; it is rather a network of different parties, a supply network.

A company should match their products with the right supply chain; lean, agile or leagile, combining lean and agile. (Christopher, 2001) A chain that is lean aims toward diminishing waste and unnecessary cost, it aims towards doing more with less. The lean approach seeks to minimize inventory, tied-up capital and to creating a just-in-time environment. An agile supply chain aims towards being responsive to market demand. Flexibility is a key characteristic for an agile supply chain as it enables responsiveness towards volatile markets. The agile approach seeks to be demand-driven and practice process alignment. A demand-driven approach requires information sharing throughout the supply chain on real demand and process alignment implies that there is a high degree of process interconnectivity between networks. Finally, an agile approach maintains buffer inventory to deal with uncertainty. (Christopher, 2005)

The first step in creating the right strategy is to investigate the company's product demands and divide the products in functional or innovative products. The functional products have a long life cycle and predictable demand while the innovative products have a short life cycle and unpredictable demand. (Fisher, 1997) Functional products fit better with a lean supply chain while the innovative products fit with an agile supply chain. However, as the market has become more and more unpredictable a combination, leagile, is also suggested. (Christopher, 2001) One example is HP that uses lean in the beginning of the production of standard modules until the customer order point then uses agile at the end (Feitzinger & Lee, 1997).

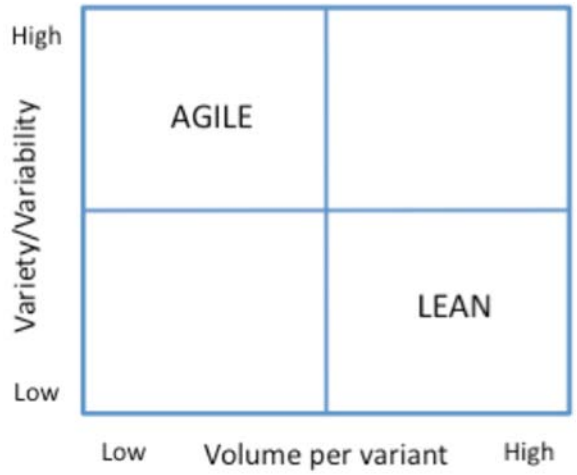

Figure 2.1 An illustration on how to determine the right supply chain. Adopted from Christopher (2001)

The Spanish clothing company Zara (Inditex) is a company that focus on customer demand and are able to respond fast to the fashion and market changes. Being agile and market driven is very important when it comes to fashion. (Mason-Jones et al., 2000). To have the right supply chain for the right product is essential (Fisher, 1997) and according to Mason-Jones et al. (2000) it is beneficial for the fashion products to have an agile supply chain that is customer driven.

2.1.2. Risk and benefits of single and multiple sourcing

According to Svahn and Westerlund (2009), single sourcing is when a company only has one supplier for each service or product. This choice of strategy is according to the authors approached when a company is seeking scale advantages through lower-cost products in a dyadic relationship or when a product is crucial for a company. Partnership between supplier and buyer within single sourcing allows long-term relationships, cooperation and shared benefits (Coastantino & Pellegrino, 2008). Furthermore, by placing all purchasing requirement with one supplier could increase the possibility to negotiate better conditions (Van Weele, 2010).

Risk of disruption of supply is a common cited argument against single sourcing (Trevleven & Schweikhart, 1988) due to the fact that a company is in partnership with one supplier and whatever the cause, natural disasters, social-political problems, fires etc. would cause disruption of supply. Apart from interruptions within supply, an inadequate supplier can cause disastrous results for a company hence in order to find the optimal supplier a set of evaluation criteria's need to be established. (Swift, 1995) Finding new suppliers would depend on the characteristics of the product and the market (Coastantino & Pellegrino, 2008). The dependency and increased risk that arises from single sourcing is a strategic decision that should not be taken by individual buyers rather a decision that should be taken by top management (Van Weele, 2010).

Utilising multiple sourcing strategies means that several suppliers are used for each service and product. Multiple sourcing reduces dependency on specific suppliers. Furthermore, it ensures reliable distribution of components and materials. (Svahn & Westerlund, 2009) In case of inadequate suppliers multiple sourcing allows a buyer to switch order to other existing suppliers (presumed they provide the same product). As the supplier already exists in the company's supplier base there is no need for searching and negotiating with a new supplier. (Coastantino & Pellegrino, 2008) Multiple sourcing utilises competitive bidding among suppliers creating an opportunity for buyers to receive lower prices (Berger & Zeng, 2005). However according to Van Weele (2010) the negative aspect of multiple sourcing is higher transactions costs caused by the loss of economic scale and the need of managing more than one supplier.

2.1.3. Risk and benefits of local and global sourcing

In today's global market, many companies strive for competitive advantages. Changes within global consumption and production have affected the distribution management of services and goods. The environment has been affected in several ways: through shifts of production activities to low labour countries and through development in the volume and transportation mode required to meet global demand. (OECD, 2010)

When sourcing globally or locally each company needs to see to their own goals and weigh the advantages with the disadvantages. There can be benefits as well as risk associated with both sourcing alternatives. (Christopher et al., 2011) The possible benefits of global sourcing are cost savings and added value. Global sourcing can offer less restrictions, cheaper operation, personnel, and plant cost, which allows the global suppliers to offer the same goods for a cheaper price. However, there are also risks by sourcing globally. (Cook, 2006) According to Senft (2014), global sourcing is more complex than local sourcing. Possible disadvantages are problems with language and cultural differences, poor infrastructure, increased handling costs due to customs regulation, natural disasters and higher uncertainty with regards to quality and on-time delivery (Cook, 2006). Longer lead time is a negative aspect when comparing global sourcing to local sourcing which usually has shorter lead times. It leads to more uncertainty and scheduling problems, which results into more tied-up inventory, reduced flexibility and reduced responsiveness. This in turn results in a higher total cost (Handfield, 1994). Political stability within countries is an aspect to consider as well, as government posture could be investment friendly or hostile (Cook, 2006). There are always risks that reside with sourcing globally however there also opportunities and in order to reach competitive advantage a company needs to mitigate the risk in order to achieve a successful supply chain. (Wilding & Braitwaite, 2007)

Local sourcing is less complex than global sourcing and requires less from the company to manage and succeed with their sourcing (Senft, 2014). In addition, the responsiveness to variation in demand is higher when it comes to local sourcing versus global sourcing (Wilding & Braitwaite, 2007). The negative factor with local sourcing is a higher price per item, which will lead to higher costs and smaller margins for the focal company (Senft, 2014). One example of a company using local and global suppliers is the major clothing company Zara.

Local suppliers in Spain and Portugal are utilised for their fashion clothes where speed, flexibility and responsiveness to variation in demand, is vital (Nebahat, 2008). The batches are smaller due to low quantity level, which allows Zara to change their collection rapidly with fewer inventories. Zara sources globally as well, with their basic products where time-to-market, flexibility, and quantity levels are not quite as important (Scozzese, 2013).

2.2. Purchasing Process

Traditionally purchasing compasses the process of buying and aims at achieving the right quantity and quality at the right time and to the right price. For this to be accomplished purchasing involves determining purchasing needs, selecting supplier, attaining a proper price, defining terms and conditions, issuing a contract and following up the supplier to ensure proper delivery and payment. (Van Weele, 2010) Historically purchasing has evolved from being part of marketing and being considered to be an administrative function to being recognised as a strategic function stressing its importance to contribute to the success of a company (ibid).

A purchasing process consists of a whole chain of activities that are interrelated, see Figure 2.2.

Step 1: Determining specification: Purchasing specifications are determined in terms of quality and quantity of the service/products that need to be bought.
Step 2: Selecting supplier: Procedures and routines are developed in order to select the best supplier.
Step 3: Contracting: Negotiations with supplier are conducted in order to establish an agreement and conclude a contract.
Step 4: Ordering: Orders are placed with selected supplier. Furthermore efficient purchasing orders and handling routines are developed.
Step 5: Expediting and evaluation: Orders are monitored and controlled in order to secure supply.
Step 6: Follow-up and evaluation: Evaluation and rating of suppliers.

Although Figure 2.2 presents a purchasing process is important to be mindful of the fact that companies may have varying purchasing processes.

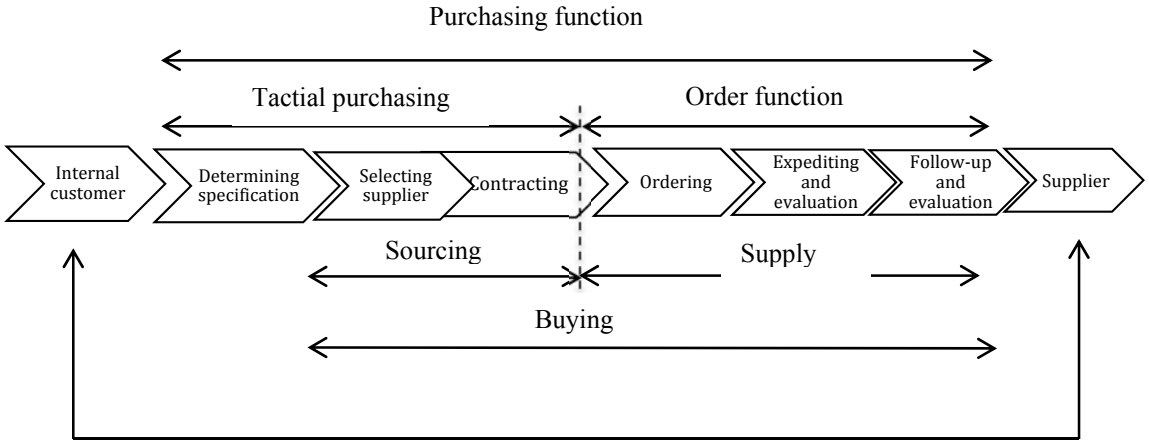

Figure 2.2 Purchasing process, Adapted from Van Weele (2010)

According to Van Weele (2010), the purchasing manager should support all activities within the purchasing function as seen in Figure 2.2. One of those activities within the purchasing function is selecting suppliers that are able to procure demanded items according to specifications (Mendoza, 2007). The activity, selecting supplier has a process of whereby the aim is to identify, evaluate, and contract a supplier. The success and failure of a buyer-supplier relationship depends on the characteristics of the relationship, the market, and interdependencies. (Wagner et al., 2013)

2.2.1. Supplier selection

Supplier selection is a central concept where problems connected to the selection process are seen as main issues when maintaining and implementing effectiveness within a supply chain system for a company (Tahriri et al., 2008). It comprises of the most important and fundamental decisions regarding buyer's choice (Sarkis & Talluri, 2002). A supplier selection is typically performed at the purchasing department, the selection should with advantages comprise multiple criteria decision-making (MCDM) where conflicting qualitative and quantitative factors have to be taken into account (Tahriri et al., 2008). The purchasing department of an organization has to deal with critical objectives concerning the obtaining of the right product for the right cost, at the right quality, the right quantity and also at the right time, all this from the right supplier. These requirements to obtain the right supplier in turn require effective decision-making regarding the supplier selection and evaluation (Sarkis & Talluri, 2002). The overall and primary objective connected to a supplier selection process is the reduction of risk related to purchase, but also the goal of developing closeness and long-term relationships between buyers and suppliers. A right choice of method for the supplier selection process will also provide a maximization of the overall value to the purchaser. When the MCDM problem is affected by several conflicting factors as mentioned earlier, trade-offs between them has to be analysed thoroughly by the purchasing manager. (Tahriri et al., 2008)

2.2.2. Supplier selection criteria

In order to select the best supplier, the right trade-off between tangible and intangible factors is vital (Tahriri et al., 2008). Tangible factors are quantitative factors, which are possible to count on. These factors can be in form of total costs of a product throughout the whole supply chain. (Benyoucef et al., 2003) These costs are costs that occur over the whole product life cycle, from material and labour cost to inventory cost. Companies often use tangible factors as COGS, where all of the costs to create a product all the way to selling the product are calculated including material cost, labour, inventory and overhead costs. (Mendoza, 2007)

Intangible factors, which are qualitative factors, are not possible to count as tangible factors (Tahriri et al., 2008). Intangible factors such as quality, service, brand reputation and flexibility is qualitative factors and therefore needs to be weighed instead of counted in order to reach right supplier selection decision (Benyoucef et al., 2003). If a company only considers tangible factors as COGS and not intangible factors such as quality and flexibility it can be more expensive to select a supplier, that offers lower COGS as it will result in higher cost in the end. Table 2.1 presents a selection of supplier criteria addressed in order of relevance. These criteria depend on the of the supplier selection problem in terms of a particular industry and specific characteristics of purchased services and goods. As seen, there are recurring criteria regardless of industry and year.

Table 2.1 Selection of supplier selection criteria

Supplier criteria	Author
(1) Net Price (2) Delivery (3) Quality (4) Production facilities and capabilities (5) Geographical location	Weber et al. (1991)
(1) Quality (2) Service level (3) On-time delivery (4) Quick response time in case of emergency (5) Flexibility to respond to unexpected demand changes	Kannan & Keah (2003)
(1) Quality, (2) Price, (3) Vendors financial solidity, (4) Delivery punctuality, (5) Know-how and product uniqueness	Nassimbeni & Sarto (2006)
(1) Quality (2) Delivery (3) Direct cost (4) Trust (5) Financial	Tahriri et al. (2008)
(1)Quality (2) Cost (3) On-time delivery (4) Rejection rate control (5) Toxic chemical usage control	Peng et al.(2015)

Supplier selection criteria has changed over time see Figure, 2.3. Before 2003 quantitative factors as cost were the most important criteria and qualitative factors such as quality was not regarded. In today's market both qualitative and quantitative factors are considered. (Tahriri et al., 2008)

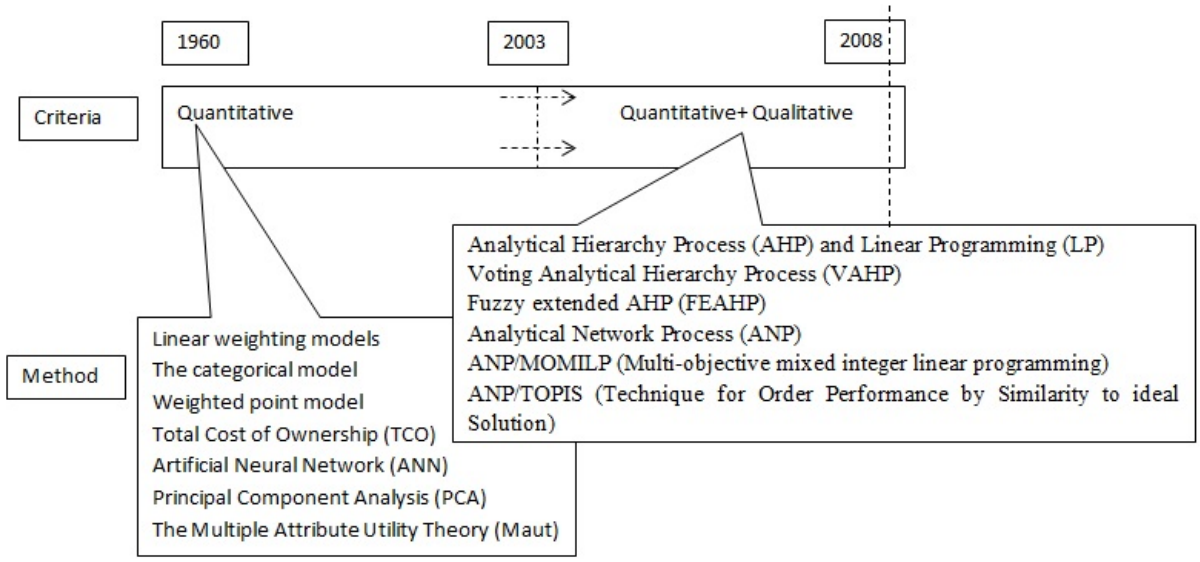

Figure 2.3 Relation between criteria and methods for SSP since 1960 (adopted from Tahriri et al., 2008)

2.3. Methods for supplier selection

Selecting the best supplier requires the purchasing manager to know and apply the most suitable method to respond and solve the multi-criteria problem with both qualitative and quantitative criteria. According to Tahriri et al. (2008), a correct trade-off decision regarding these qualitative and quantitative factors is vital when selecting the right supplier for the company. The method choice for a supplier selection for a company can often comprise of a combination of several different methods, just to take advantage of the different strengths that suits the company's specific selection needs. The choice of method combination is obviously of vital importance and will affect the overall supplier selection process and the following outcome of it when applied and therefore it is of importance to identify, clarify, and understand a company's choice of supplier selection method. (Ibid)

Supplier selection models consist of a variety of approaches used to rank how well they fulfil the specific and prioritised requirements set by the purchaser. Common classification of methodologies developed for suppler selection includes mathematical programming models, statistical models, weighting models, and Total Cost of Ownership (TCO) models. (Sarkis & Talluri, 2002) Most mathematical programming models have a single objective to maximise profit or minimise cost. Techniques applied to these models are non-linear and linear programming, mixed integer programming, multi-objective programming, and goal programming. (Mendoza et al., 2008) Statistical models deal with stochastic uncertainty related to vendor choice. An instance of stochastic uncertainty is the predictability of how internal demand for a service or item will develop. (Boer et al., 2001) Although stochastic uncertainty is common in many purchasing situations not many models can handle this problem (Boer et al., 2001) furthermore it is stated by Mendoza et al. (2008) that not many studies have been done within this field.

According to Tahriri et al. (2008), the weighted models are among the most common approaches used during sourcing decisions. A linear weighting model places a numeric weight on each selection criteria. The weight is determined subjectively, with the highest weight indicating the highest importance. Once the weight is concluded the total sum of the supplier's' performance is multiplied by the weight thus obtaining a single figure for each supplier by which the supplier with the highest overall rating is chosen. This approach is highly dependent on human judgement and proper scaling of criteria values. (Mendoza, 2007) There are several approaches when using a linear weighting model, of which the AHP model was selected for this study. TCO models consist of several or all costs associated with the choice of vendor. (Boer et al., 2001)

2.3.1. Analytical Hierarchy Process

AHP is a multi-attribute decision-making tool for supplier selection processes, which is one of the most critical activities of purchasing management's task in a supply chain (Sarkis & Talluri, 2002). According to Tahriri et al. (2008) the AHP method has been basis for many outstanding works within a broad range of different decision areas, and has dealt with selection within resource allocations, optimization as well as development projects (Benyoucef et al., 2003). The method is a quite simple approach to use, understand and apply. It allows purchasing managers to determine and quantify preferences for the selection purpose and then rate them after certain stated criteria (Sarkis & Talluri, 2002). From this complex selection, problem can be arranged into a hierarchy, a hierarchy which mostly consist of at least three different levels. These levels can be divided into; *the goal*, *the criteria* and *the alternatives*, concerning a supplier selection, the goal is then to select the very best suited supplier for the mission. Order quantity, price, lead time and service might in this case be important criterions to compare in between the supplier range offered. A simple overview of the hierarchy is presented in Figure 2.5 below. The AHP is a method well suited for the purpose of selecting suppliers, this when the method ranks alternative criterions and compare how well these are performed by and among the different alternative supplier candidates. (Benyoucef et al., 2003)

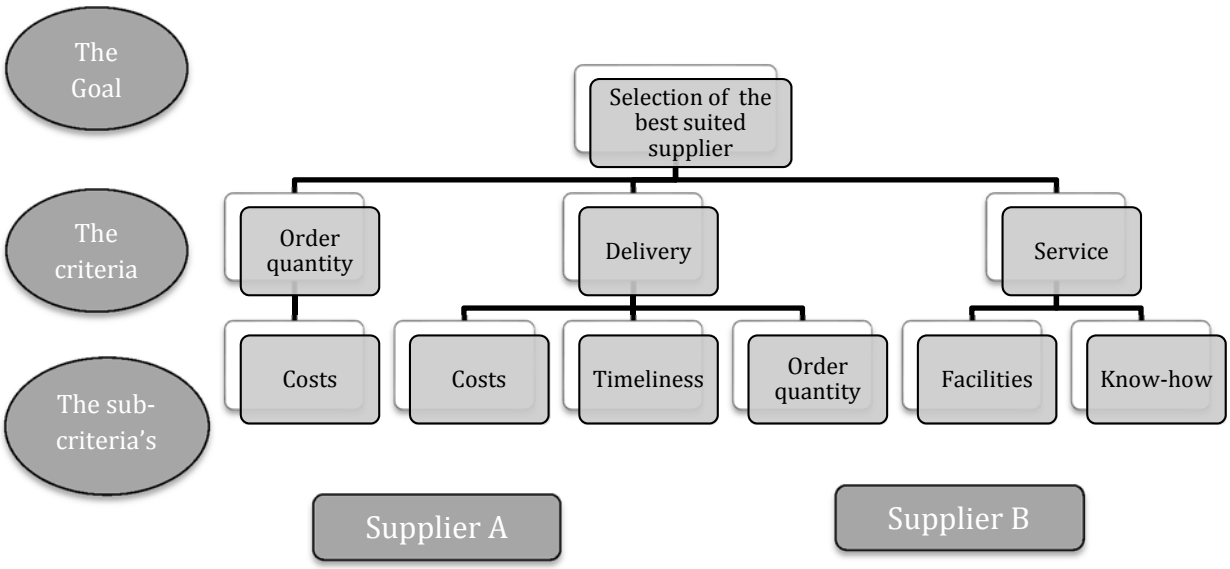

Figure 2.4 Hierarchy structure for simplifying complex selection.

Every supplier rating procedure begins with a determination of what criteria to be selected and used as references for assessing the supplier. The very first step in the AHP is determining what major criteria to be included when to compare suppliers. The following step consists of getting a view of to what extent they fulfil these criteria. (Nydick & Hill, 1992) Each of these criterions will be rated using a scale, this in order to identify the relative

importance for each of them meeting the main goal set for the hierarchy structure. (Tahriri et al., 2008). According to Benyoucef et al. (2003) even if the range of scales for quantifying managerial judgments are broad, there is a standard usage for the AHP analysis. The measurement scales are presented in Table 2.2 below, where 2, 4, 6, and 8 represent intermediate values between two adjacent judgements for the measurement scale. The evaluation of the criteria done through the comparison is usually done by the customer itself. (Tahriri et al., 2008)

Table 2.2 Measurement scales used during AHP

Verbal judgment or preference	Numerical rating
Extremely preferred	9
Very strongly preferred	7
Strongly preferred	5
Moderately preferred	3
Equally preferred	1
Intermediate values	2, 3, 6, and 8

According to Tahriri et al. (2008), the following step is to define the sub criteria and sub sub-criteria, and later weight and compare these pair-wise. According to Benyoucef et al. (2003), a pair-wise comparison matrix is applied for the comparison of the criteria and states that if there are n items that need to be compared for a given matrix, then a total of n(n-1)/2 judgements are needed for it. Benyoucef et al. (2003), continues this with that there are two reasons for apparent savings in the required number of judgments, at first since all criteria are equally preferred compared to itself, 1's are placed along the diagonal for the comparison matrix. And the corresponding positions below the diagonals in the matrix are the reciprocals of the judgments that already been entered. This can easily be exemplified by assuming a pair-wise comparison of order quantity and lead time is a 3, from this it follows that a pair-wise comparison of lead time and order quantity will generate 1/3. In Table 2.3, an example of pair-wise comparison is shown.

Table 2.3 Example of pair-wise comparison

Criteria's for Supplier selection	Cost	Lead time	Order quantity	Service level	Weights
Cost	1	3	1	3	0.40
Lead time	1/3	1	1/3	1	0.13
Order quantity	1	3	1	1/2	0.26
Service level	1/3	1	2	1	0.21

After the pair-wise judgments has been obtained and the weighted as seen in Table 2.3 the following step in the AHP method for the supplier selection according to Benyoucef et al. (2003) is computation of normalized weights for all levels of the hierarchy as in Table 2.4 below.

Table 2.4 Normalized weighting matrix

	Geometric mean		Weights
Cost	(1x3x1x3)^(1/4)	= 1.73205	0.40
Lead-time	(1/3x1x1/3x1)^(1/4)	= 0.57735	0.13
Order quantity	(1x3x1x1/2)^(1/4)	= 1.10668	0.26
Service level	(1/3x1x2x1)^(1/4)	= 0.90360	0.21
	TOTAL SUM	= 4.31968	

The final step for the selection process is to compare the results from these steps and then get an insight of how well they meet the set goal. (Nydick & Hill, 1992)

According to Jounio (2013), the AHP method requires a consistency check, which is a vital step to ensure and verify the consistency of the done priority judgements from the pair-wise comparison step in the method. The consistency check's mission is to tangibly measure the level of existing consistency for how well the judgements have been comparing to large samples of purely random judgements. Tahriri et al. (2008) states the consistency check as one of the most essential steps within the AHP method, to prevent possible inconsistency. For the implementation of the consistency check there is a consistency ratio (CR) computation formula to determine the acceptance of the priority weighting as follows as:

$$CR = \frac{Consistency\ Index\ (CI)}{Random\ Consistency\ Index\ (RI)} \qquad (1.1)$$

Jounio states that $A_x = \lambda_{max} * X$, where A is the pair-wise comparison matrix with X rows. The CI can be calculated through the following equation:

$$CI = \frac{\lambda\text{-}n}{n\text{-}1} \qquad (1.2)$$

Where *n* represents the number of criteria.

The Saaty's table, Figure 2.5 presents the random consistency value, the reference values of RI for different set of matrix sizes.

The size of matrix	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Random Consistency	0	0	0,58	0,9	1,12	1,24	1,32	1,41	1,45	1,49

Figure 2.5 The Saaty's table. Random consistency index.

As long as the calculated CR value calculation (1.1), is lower than 0, 10 the pair-wise weight comparison is seen as valid and consistent, thus acceptable. If not, the pair-wise weight comparison will require further analysis. (Tahriri et al., 2008)

2.3.2. Total Cost of Ownership

TCO is a methodology and philosophy used to understand the relevant cost of purchasing a particular service or goods from a particular supplier. It is used as a tool to support strategic cost management in the sense that the buying firm is required to determine which costs it considers significant in the acquisition of a service or goods. TCO may include costs such as the price paid for the item, costs for order placement, selection and evaluation of supplier, transportation, receiving, inspection, rejection, storage and disposal. (Ellram, 1993)

According to Khurrum & Faizul (2002) TCO is a complicated approach, which requires an identification of costs that are of importance in the acquisition, possession, use and disposition of a service or good to the buying company. TCO can be applied to any type of purchase. Furthermore the cost factors that are considered are unique by item or type of purchase. Selection and evaluation approaches that are aligned with TCO are zero-base pricing, cost-based supplier performance evaluation, life-cycle costing, and the cost-ratio method. The common factor of *zero-based pricing* and *cost-based supplier performance* is the focus on understanding the suppliers total cost. In contrast to TCO, zero-based pricing focuses mainly on understanding the suppliers cost pricing structure and the supplier cost of conducting business. Cost-based supplier performance evaluation has more focus on the external cost of doing business while TCO focus on both the external and internal costs. *Life cycle costing* focuses mainly on capital and fixed assets. The main goal of this approach is to understand the purchase price of an asset and determine the actual cost of using, maintaining and disposing the asset during its lifetime. There is usually less emphasis on pre transaction costs which TCO includes. Although TCO is broader in scope, the life cycle approach represents a subset of TCO activity. (Ellram, 1995) With the *cost-ratio method,* factors that increase costs are identified e.g. costs tied to late deliveries or poor quality. These costs are added to the total purchasing price. These costs are then divided by the total purchasing price thus creating an index that is used when evaluating the true cost of conducting business with a supplier. (Ibid)

It is mentioned by Ellram (1994) that other supplier selection methodologies such as weighted point disregards costs that are associated with supplier performance, an aspect that is considered to be a strength with TCO. Benefits enlisted by (Khurrum & Faizul, 2002) and Ellram (1993) are among others an improvement of the quantitative measurement of supplier performance, by providing a quantitative method for measuring the results of performance improvements. It acts as a tool for benchmarking as the TCO data can be used to compare suppliers. Decision-making is improved as good basis of a complete cost data on important cost issues are provided. Finally, both the external and internal communication for the purchasing function is improved as the system can provide solid data to suppliers regarding their performance. It could help bridge customer and supplier by helping optimise a use of resources for both partners. Drawbacks that are associated with TCO is the level of complexity in adopting the approach. There is no standard approach to TCO analysis as models used by companies vary and may vary within the company depending on the item or class purchased. Adapting to TCO may require a cultural change from price orientation to total cost orientation, a reason to why TCO is considered a philosophy rather than merely a

tool. (Khurrum & Faizul , 2002) Lack of understanding TCO may result in poor decisions creating a negative effect on the company´s profitability, competitiveness, product mix strategies and pricing decision. (Ellram, 1995)

When using TCO there are two categorical approaches that can be utilised, dollar based approach and the value based approach. The dollar-based approach or currency-based approach requires a compilation of all actual cost data in order for an estimate of each TCO elements to be concluded. The dollar-approach is the most straightforward of these two approaches. The value-based approach takes qualitative considerations into the TCO calculations. This is accomplished by assigning point values to key decision criteria. Each TCO element is then weighted by the decision criteria in order to create a composite TCO that embeds the qualitative factors. (Radziwill & DuPlain, 2010) According to Ellram (1995), value based models require a good deal of fine-tuning and effort to develop the proper weightings and point allocations in order for them to reflect the TCO. As the weights are subjective, they may change in line with the organization's priorities. Ultimately, most value-based approaches to calculating TCO are limited to the subjective considerations, reducing their usefulness (Radziwill & DuPlain, 2010).

3. Methodology

This chapter starts with discussing the study design at which different methods for data collection and analysis are introduced. The work process of the thesis is thereafter presented. The different ways of collection data is divided into sections, at which each section explains the process of data collection and analysis. In the last section the quality issues of the research, i.e. reliability and validity are discussed.

3.1. Study design

In order to carry out a master thesis, the type of research methods needed to gathering and analysing data has to be settled. It is important to choose a research method that fits the purpose and contribution of the study as well as the researcher's presumptions about the problem (Gustavsson, 2008).

According to Yin (2014) the case study method is preferred when “how”, “why” or “what” questions are being posed; when a research has no or little control over behaviour events; and when the study is a contemporary phenomenon within its real-life context. For these reasons, the case study method has been used in this thesis. When examining contemporary events, the study may rely on historical data, interviews of persons involved in the events and direct observation of the events being studied. A case study can include single or multiple researches with a mix of qualitative and quantitative approaches. (ibid) According to Malterud (2001), a combination of qualitative and quantitative approaches may be practiced to obtain an understanding of the meaning and implications of the findings. This thesis has applied interviews and several discussion forums in order to collect and analyse data. An immense part of the data and analysing of data was based on statistical figures and numbers.

When conducting a research or investigational work there are different approaches to which it can be done, inductive, deductive or abductive. An inductive approach is based on observations from which theory is later formulated at the end of the research. As there is no applied theory at the beginning of the study, the researcher is free to alter the direction of the study. A deductive approach is the opposite of the inductive meaning it starts with theory, formulates a hypothesis that is to be tested through observations and ultimately either confirming the original theory or not. An abductive approach usually starts with an incomplete set of observations and proceeds by seeking for the most likely explanation. (Åsvoll, 2014). In this thesis there was a back and forth approach in collecting theoretical research and data collection and the approach used could be concluded that be abductive. Theoretical research and interviews were conducted prior to the data collection. Throughout the data collection there was need for more theoretical research in order to conclude the most appropriate method of analysing the data. Furthermore meetings where arranged throughout the case study in order to illuminate what was not clear.

3.2. Work process

In order to fulfil the purpose of the thesis, the work process was divided into different phases see Figure 3.1 below. The work process for the thesis was **initiated** by an interview with the case company at which the purpose of the thesis was discussed and the challenges that the company is facing were presented. Interviews with personnel relevant to the case where arranged in order to facilitate the process of understanding the current challenges the company is facing. With a clear understanding of the issues at hand, **the second phase** within the work process was to gather theoretical literature. Conducting a theoretical study was necessary in order to see previous research studies and findings in order to conclude the most appropriate way to proceed with the case. The theoretical findings presented several sourcing models from which the most suitable for the case was selected, furthermore in order to identify relevant selection criteria it was necessary to conduct research studies within the area as well. **The third phase** of the process was the data collection at which, the selected models were initially presented to the supervisor[1] at Ellos at several occasions during which alterations were made according to discussions that took place. Data collection for the sourcing models was an on-going process throughout the work process, it was provided partly by the supervisor and the rest from various co-workers. Once the alterations to the sourcing model were of satisfactory a presentation with the product managers was due as they would sit with these models. Discussions on the usefulness of the models and possible improvements were the centre of discussion. Theoretical studies have been an on-going process that proceeded throughout the data collection. **The final phase** of the process consisted of a discussion and conclusion. The research questions are discussed and evaluated in the discussion and the purpose of the thesis is foreclosed in the conclusion.

[1] Lars Sandell (Sourcing Manager, Ellos Group)

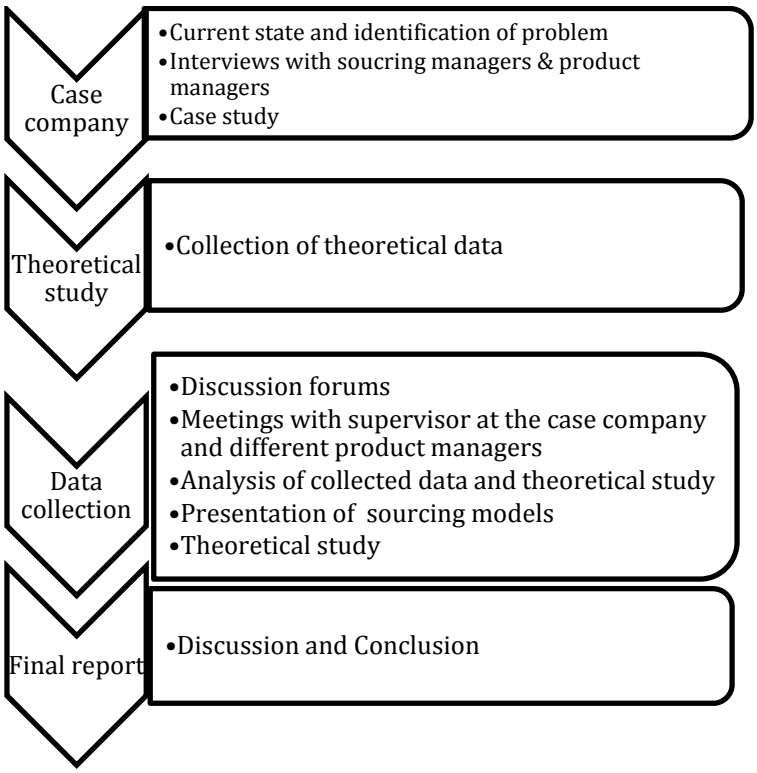

Figure 3.1 Breakdown structure of work process

The quantitative data was presented and analysed in measurable models. When conducting literature research, several supplier selection models where frequently presented. A thorough research was done on sourcing models in order to weigh benefits and drawbacks and most importantly determine which model would be best suitable for the case. It was concluded that a mix of TCO and AHP would generate an objective and subjective model based on both quantitative and qualitative selection criteria. The TCO model would provide a cost analysis of the selected products from supplier. As the sourced products are similar, a layout of significant costs within the acquisition would provide a direct comparative analysis between the suppliers. Apart from cost it was important to compare softer attributes from a supplier such as for instance technical knowhow as these attributes where as significant as the cost. The AHP model which is considered to be the one of the most widely used linear weighting tool, provides a framework for multiple criteria from which a total score would be generated for each supplier. In order to facilitate the analysis of the final results from both models, the final results from both models were combined into a cost-benefit diagram. The cost-benefit diagram would provide both the cost resulting from the TCO model and the benefits resulting from the AHP model thus facilitating an analysis from both models.

3.3. Interview

The initial interview was of unstructured nature with the Business Developer and Business Development Manager[2] at Ellos (see the interview guide in Appendix B). Unstructured interviews are similar in character to a conversation where the interviewer has a question in which the interviewee answers freely (Bryman & Bell, 2003). The initial interview facilitated in the semi-structured interview that later followed based on collected information from the initial interview. Semi-structured interviews often refer to an interview that is carried out with a series of prepared questions but is flexible in the sense that the interviewer can ask unpaired questions (Bryman & Bell, 2003). As the purpose to attain a better understanding of the overall structure of the different departments within fashion with focus on Ellos own brand and the issues the company is facing, interviews were conducted with product managers from the purchasing department within the ladies, men's, shoe and finally home and textile department (see the interview guide in Appendix C). A total of seven interviews were conducted from which five different product managers, two business developers and a sourcing manager were questioned (Table 3.1). All interviews where held face-to-face and the duration of each interview was for approximately an hour each. Most of them were conducted one to two months into the work. In order not to forget valuable information from the conducted interviews, two researchers were in charge of making notes while the third was asking majority of the questions. Responsibilities when conducting interviews could vary depending on number of researches present at the meeting. Furthermore, most of the interview samples were recorded on tape to have as back up. After each section the transcripts were discussed by the researchers and corrections and comments were made.

The selection of interviewees was done through consultation, although the sourcing model was developed for the fast fashion products. It can be adapted to suit other products segments thereof the need for interviewing product managers working with different product segments. Collection of quantitative data was also done in consultation as tender prices from the supplier in Turkey was based on historical data while the tender prices from the supplier in China were provided in order to perform an analysis on similar products from different suppliers situated in different geographical locations. Following respondents were interviewed during the case study:

Table 3.1 Compilation of interviewees

Lars Sandell	Sourcing Manager
Annika Mårtensson	Business Developer
Nicklas Hellgren	Business Development Manager
Monika Färdigh	Product Manager/Purchaser Ladies Department
Britt-Inger Dahlborg	Product Manager/Purchaser Home Textiles Department
Lowe Wittzell	Product Manager/ Purchaser Men´s Department
Susanna Andersson	Product Manager/ Purchaser Shoes Department

[2] Annika Mårtensson (Business Developer at Ellos Group) and Nicklas Hellgren (Business Development Manager at Ellos Group) Interviewed 2014-03-05

3.4. Discussion forum

A discussion forum with the sourcing manager and the business development manager was conducted to discuss the findings. The discussion forum lasted for approximately an hour. Based on the semi-interview with the product managers see Table 3.1 a prototype of a TCO model was concluded and presented. Prior to the meeting neither the sourcing manager nor the business development manager had seen the TCO prototype, the discussion was therefore initiated by a presentation of the prototype. Discussions on cost factors relevant to TCO were the centre of the attention throughout the forum. The discussion forum was interactive, in which questions were asked regarding both the prototype and the purchasing process within Ellos. Although the agenda of the forum was to discuss the preliminary prototype, a briefing of the purchasing process was necessary in order to understand and conclude the selected cost factors within the TCO model. As a result of the discussion forum, the cost factors were concluded and the next step was to collect data. Information on personnel that would provide respective data was provided during the forum and throughout the case study. Quantitative data that was collected was used within the TCO model, enabling an analysis of the products supplied from the supplier in China and the one in Turkey. Contact with the souring and business development managers continued throughout the development of the TCO in order to receive feedback. Parallel to developing the TCO model, the AHP model was developed at which it was necessary to determine proper criteria that would be used. The criteria were initially selected based on findings from interviews and presented to the sourcing manager. The objective of the meeting was to present the AHP model, evaluate and determine which criteria were of relevance to the case at hand. The second discussion forum was booked with the sourcing manager and two product managers from different product segment, Men's department and Home and Textile department. The purpose was to present the concluded models and receive feedback. The supplier criteria where discussed to determine their relevance and to what extent it could be used by individuals with regards to the time a decision need to be made.

3.5. Reliability and Validity

The validity refers to the level of liableness of the measurements that have been conducted. The validity requires that a researcher actually measure what is intended to be measured. (Ejvegård, 2009) Validity has a number of different aspects of which it can be divided into such as external validity, internal validity and reliability. External validity is the extent to which results can be generalised to other settings while internal validity is the extent to which a non-spurious causal relationship can be established, it occurs in the data analysis. Reliability is the extent to which a study can be repeated with the same result, it occurs during data collection. (Voss et al., 2002) As the report was based on one case, generalizability (external validity) is difficult to achieve since the results are specific for the case. Generalizability will still be achieved to a certain degree through identification of criteria from the case company that can facilitate comparisons to other companies. Criteria such as cost, quality and lead time are examples seen in Table 2.1, in which the criteria where ranked according to importance. In order to maintain internal validity several interviews and literature were used when identifying criteria for the sourcing model. As personnel from different departments where

interviewed it could be concluded that there were recurring challenges regardless of commodity. Combined with literature studies the criteria could be concluded.

As only one case was studied, it is difficult to reach a high degree of reliability in terms of the data analysis. The interviews have been vital for the progression of the thesis, and have had a major input for the analysis and the choice of analytical tool for the supplier selection. The interviews have been made in order to get a supportive overview of the company and current way of handling supplier selections. Interviews have been arranged at different departments at the company with both product managers and sourcing managers, this to both get a deeper knowledge about how the supplier selection process distinguish from each other among the different purchasing departments, and obtain an overall picture of the supplier handling. The interviews can then be seen as a critical element for the thesis when product managers from different product segments have been involved and the supplier issues may have varied. Additionally, to this there has been a risk whether the answers have been interpreted correctly or not from the interviews. Another issue to take into consideration when considering reliability are the sources that were explored when developing the sourcing model. Although theoretical studies were conducted and the development of the model was done under the guidance of the supervisor at Ellos, this has influenced the final results as discussions have mainly been with the supervisor at Ellos during the development of the sourcing model. The focus on the case company, without analysing and studying other external companies dealing with a similar supply chain, may also have caused a lack of a wider view and external information, which could have increased the validity for the thesis work. Due to this, the model cannot be considered as a general model as the development was based on Ellos preferences and custom made for the fast fashion segment within the company.

4. Empirical findings

This section presents the purchasing process at Ellos and address subjects such as supplier relationships and minimum quantity.

4.1. Company description

Ellos was founded by Olle Blomqvist in 1947. The Ellos Group was previously part of Redcats a subsidiary to the French multinational company Kering previously called Pinault-Printemps-Redoute (PPR). In 2013 The Ellos Group was acquired by Nordic Capital Fund VII. The Ellos Group has a yearly turnover of more than €2.4 billion and over 720 employees. The Group is headquartered in Borås, Sweden serving primarily Sweden, Norway, Denmark and Finland. The Ellos Group consists of Ellos and Jotex, forming the largest remote shopping marketplace for apparel and textile within Scandinavia. Ellos and Jotex offer a broad product range of which Ellos offers products within fashion and home, and Jotex within textile and decoration. With products sold through catalogue and on-line, 70 percent of orders are sold through e-shopping platform. Ellos sells their products through e-shopping and catalogue. While their own brand and other brands are sold through electronic retail, the catalogue only offers products from their own brand. Currently 95 percent of Ellos own products are bought from Asian suppliers whereas only a few are bought from suppliers in Europe. The purchasing of the products for the two sales channels, e-shopping and catalogue consists of one single process. Design and development of Ellos core collection is done in house while manufacturing is outsourced to Asia and Europe with the majority placed in Asian countries like Bangladesh, Asia, and India. The finished products are shipped to the warehouse in Borås through a combination of airfreight, sea transport and road transport.

4.2. Ellos purchasing process

Previously Ellos was a part of Redcats that was owned by Kering, a French multinational company previously known as Pinault-Printemps-Redoute (PPR). Although Ellos no longer is part of Redcats, they maintained their relation with Kering´s suppliers and sourcing department. Most of the supplier selection, quality and supplier evaluation is done through Kering. According to Sandell[3] Ellos is able to gain more bargain power towards suppliers through Kering, due the many brands the company works with. Kering is a common ground among the departments in regards to suppliers. It must be stated that Ellos not only follows Kering´s recommendations of suppliers, but seeks for suppliers through other channels as well. Figure 4.1 shows the distribution of the sales percentage on the departments. The departments can be divided into different segments according to product type, for example in ladies department it can be fast fashion department or functional outerwear product type.

[3] Lars Sandell (Sourcing Manager, Ellos Group) interviewed 2014-05-26

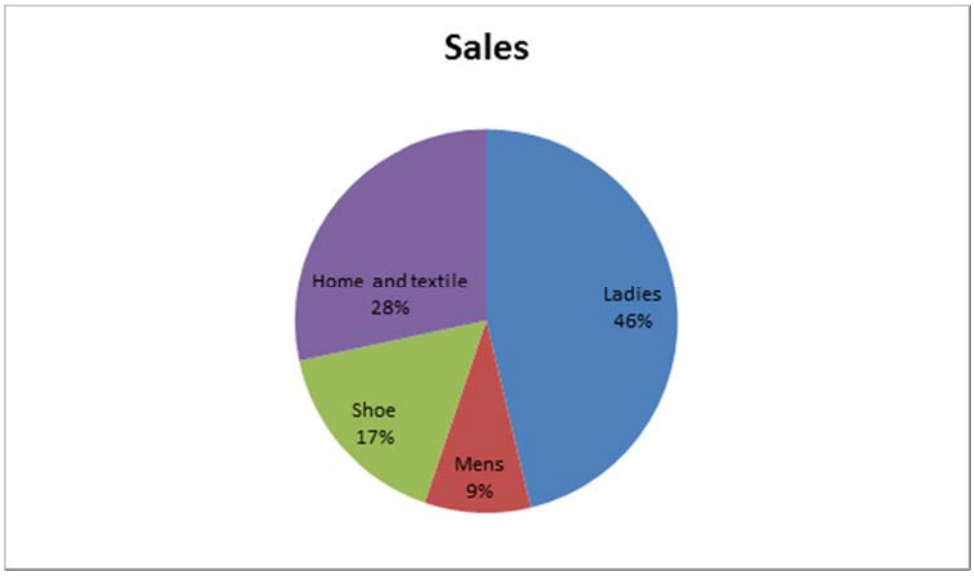

Figure 4.1 Sales distribution between the departments

The supplier relationship for the departments consists mostly of long-term relationships. According to Färdigh[4], this high amount of long-term relationships with suppliers has been important in order to ensure and maintain desired quality and deliveries. Reasons for the short-term relationships are due to, for instance dissatisfaction on quality or quantity delivered by supplier, new products or specific characteristic designs that cannot be offered by current suppliers. Quantity of orders is a challenge to Ellos towards suppliers. Minimum quantity is an issue for all departments, especially for shoe and men's department due to small sales distribution (see Figure 4.1) and therefore many departments collaborates for leverage and power with suppliers. According to Wittzell[5], the men´s department utilises the same supplier base as the ladies department, giving the men´s department the leverage and power they need. Andersson[6] explains that negotiating with suppliers and being able to achieve deals that allows the company to reach desired orders is the goal in order not to end up with excess inventory. Ellos has to fight for their orders to be carried through due to their size as actors. Maintaining relationships is therefore essential.

Home and textile faces the same challenges as other departments regarding the minimum quantity requirements offered by suppliers. However, according to Dahlborg[7] with the help of multiply sourcing and the purchasing manager's knowledge and experience of set minimum quantity offered by suppliers from the different countries, the purchase can go quite smoothly. For instance, suppliers in Spain has no minimum quantity, on the other hand the supplier costs are higher. Meanwhile the suppliers in Pakistan have a high minimum quantity but lower price. The suppliers in Europe offer more special products, which the consumer may be willing to pay for.

[4] Monica Färdigh (Product Manager/Purchaser Lady's Department) interviewed 2014-07-07

[5] Lowe Wittzell (Product Manager /Men's department) Interviewed 2014-08-11

[6] Susanna Andersson (Product Manager/Purchaser Shoes Department) Interviewed 2014-08-11

[7] Britt-Inger Dahlborg (Product Manager/Purchaser Home Textiles Department) Interviewed 2014-07-28

This thesis is as mentioned before focused on the fast fashion segment from ladies' department and the issues with supplier selection considers this segment. Ellos does not use a specific sourcing model for suppliers, the sourcing is based on long experience within the industry. As previously mentioned Ellos has collaborations with Kering through their buying offices. These offices are situated in China, Bangladesh, Turkey, India and Pakistan. It is a total of seven offices and three satellite offices, with the satellite offices located close to the factories. The supplier base is created through the buying offices, furthermore the offices also manage the supplier relations. Apart from the existing supplier base through the buying offices Ellos also has a supplier base outside of these offices. Tactical purchasing which entails the strategic selection of a supplier (see Figure 4.2) is not performed solely by the buying offices. Ellos handles the supplier's base that exists outside of these buying offices. The same is applied to the order function from which orders are placed towards suppliers. The main objective of the collaborative nature with the suppliers is to a build long term relationship. Ellos desires to optimise the supplier base within each category, as the suppliers are specialised within different garment/material. With a reduced supplier base key suppliers need to be identified by determining, the collaborative character with the supplier and the contributions a key supplier provides.

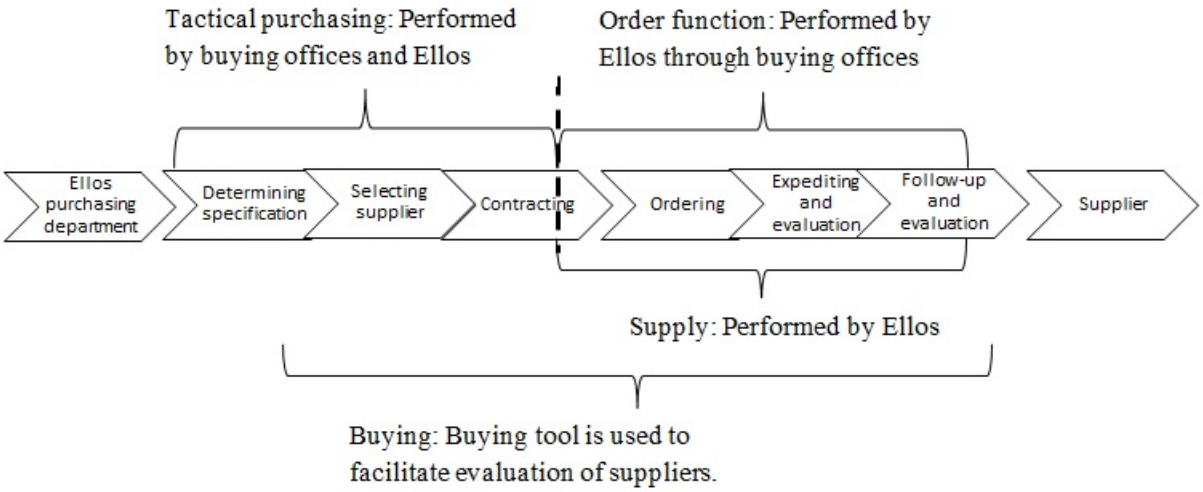

Figure 4.2 Purchasing process adapted from Van Weele (2010)

Not all activities within the purchasing process (Figure 4.2) are managed by Ellos within the purchasing function as most of the supplier selection, quality and supplier evaluation is done through Kering. Prior to the purchasing process a product specification is provided through design and product development. Ellos purchasing process involves the purchaser conducting an evaluation on the procurement of a product, by evaluating how much will be sold and the outgoing price of the product. A buying tool is used conducting this evaluation, it provides purchase proposals based on factors such as, for instance the life cycle of the product and frequency of purchase. The buying tool is meant to be an aiding tool when evaluating suppliers. The purchasing inquiry is sent together with the product specification through the

buying offices from which a tender is acquired. As seen from the figure above, *buying* includes all but the first step of the purchasing process. *Supply* relates to *buying* and is based on the total cost that will be inquired by the company. The purchasing process is based on COGS, a focus that Ellos would like to change by incorporating other factors such as lead time, minimum quantities.

When selecting suppliers Ellos bases the decision on COGS, thus overlooking other factors. A sourcing model that considers quantitative factors and also qualitative factors would facilitate the supplier selection process and show when it is more beneficial to source locally or globally. The sourcing model can also be used during a supplier selection between suppliers within the same country.

5. Development of sourcing model

This chapter will address the research questions formulated in Chapter 1. It initiates with identifying supplier selection criteria for a supplier selection process and establishing selection criteria that are essential for Ellos. Once the selection criteria are established the next step is to determine how they should be weighted and applied to a sourcing model. An established model will enable a comparative analysis on suppliers thus facilitating the decision process on whether to source locally or globally in a particular case.

5.1. Selection criteria

There are several studies that have identified selection criteria for the supplier selection process. Although these studies rank the selection criteria differently, the criteria are recurring in the studies. Table 2.1 illustrates the ranking of identified selection criteria by different research studies, these are ranked according to order of relevance. Based on Table 2.1 a selection of criteria was executed based on the criteria that were essential for Ellos. Four selection criteria were identified; lead time, minimum quantity, service, and costs. Cost was divided into several factors and compiled using the TCO model. In order to divert from focusing on COGS the AHP model was used to analyse the remaining criteria. The final results from both models were thereafter combined into a cost-benefit diagram.

5.2. Weighting of selection criteria based on AHP

According to Benyoucef et al. (2003) the AHP model can be used to select and evaluate existing suppliers by ranking how well suppliers perform stated criteria. The model has a hierarchy structure consisting of three levels. The levels are divided into: the goal, i.e. the desired aim, the criteria, i.e. determined preferences and the alternative, i.e. selected suppliers. Each criteria is weighted by providing a numeric weight, with the highest weight indicating level of importance. The selection of criteria was based on literature and product type. These criteria were chosen together with the sourcing manager for the fast fashion products for one supplier in China and one supplier in Turkey, see Figure 5.1.

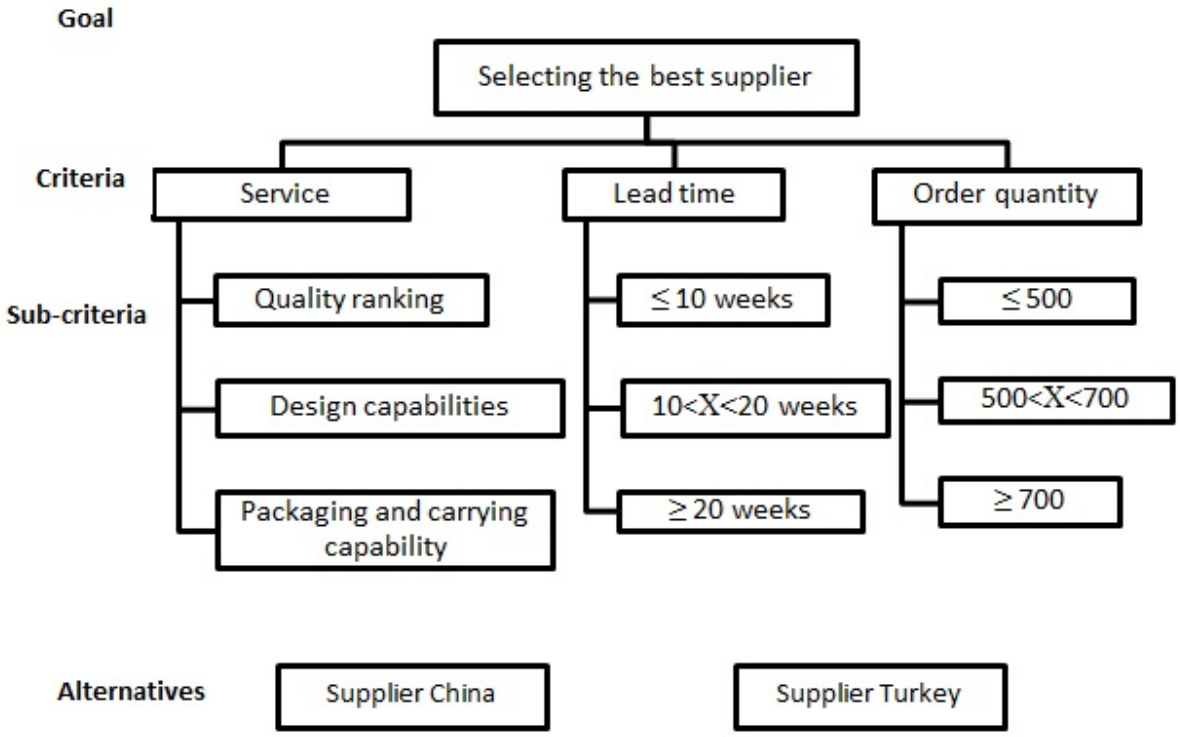

Figure 5.1 Analytical Hierarchy Process of supplier selection criteria

Lead time was chosen because of the short life cycle and high variation in demand that comes with fast fashion products. The sub-criteria's on lead time were based on different ranges, under or equal 10 weeks, between 10-20 weeks and over or equal 20 weeks.

Minimum order quantity and small batches are important when it comes to fashion products due to the high uncertainty. If Ellos are forced to make an order of a product that are higher than the wanted quantity due to the supplier minimum quantity, it could lead to more inventory and more sales which results in more costs. The sub-criteria where based on the actual minimum quantity that are set for different suppliers. Under or equal 500, between 500-700, and over or equal 700 items.

Service is a broad criteria as it compiles supplier performance towards the focal company. The sub-criteria *quality ranking* is based on how high a supplier is ranked in quality. *Design capabilities* are what design types and technical know-how the supplier can offer. *Packaging and carrying capabilities* is the suppliers' ability to deliver products to the desired place at the right time.

Once the criteria are determined, the next step is to conduct a pair-wise comparison of the main and the sub-criteria's. The pair-wise comparison is conducted by determining preferences between criteria. The three main criteria in the hierarchy are compared see Figure 5.1 two at a time. The criteria are compared based on how important they are to the case company with respect to the goal.

Table 5.1 Pair-wise comparison matrix

Criteria	Service	Lead time	Order quantity
Service	**1**	1/2	1/2
Lead time	2	**1**	2
Order quantity	2	1/2	**1**
Total	5	2	3,5

As seen in Table 5.1 each criteria is given a preference value (based on Table 2.2) according to the case company features and goal. The preference value (1/2) of the lead time criterion means that lead time is given moderate importance than service. Correspondently order quantity is given moderate importance than service and preference value (2) means that the criterion lead time is moderately preferred to order quantity.

Once the pair-wise comparison is complete, the next step is to adjust values measured on different scales to a common scale. This is achieved by the dividing the figure in one column with the total of that column. An example is the normalised calculation of the service=1/2=0,20. Table 5.2 presents the normalised matrix of the paired comparison as well as the weight. Table 5.3 present a calculation of the normalized weights for all levels in the main criteria.

Table 5.2 Normalized matrix of paired comparison

Criteria	Service	Lead time	Order quantity	Weight
Service	0,20	0,25	0,14	0,198
Lead time	0,40	0,50	0,57	0,490
Order quantity	0,40	0,25	0,29	0,312
	1	1	1	

Table 5.3 Normalized weighting matrix

	Geometric mean	Weights
Service	$(1 \times \frac{1}{2} \times \frac{1}{2})^{1/3}$=0,62996	0,198
Lead time	$(2 \times 1 \times 2)^{1/3}$=1,58740	0,490
Order quantity	$(2 \times \frac{1}{2} \times 1)^{1/3}$= 1	0,312
	Total Sum=3,21736	

The AHP method requires a consistency check in order to ensure and verify the consistency of the judgements from the pair-wise comparison. This is an essential step as it determines the

acceptance of the priority weighting. Computation of the consistency ratio (CR) is seen in formula (1):

$$CR = \frac{CI}{RI} \quad (1)$$

CI is calculated through formula (2), while RI is derived from the Saatys table (see Table 2.5) for a matrix size of three, RI=0,58.

$$CI = \frac{\lambda_{max}\text{-}n}{n\text{-}1} \quad (2)$$

$A_x = \lambda_{max} * X$, where A is the pair-wise comparison matrix with X rows (3)

$$0{,}198\begin{bmatrix}1\\2\\2\end{bmatrix} + 0{,}49\begin{bmatrix}1/2\\1\\1/2\end{bmatrix} + 0{,}312\begin{bmatrix}1/2\\2\\1\end{bmatrix} = \begin{bmatrix}0{,}60\\1{,}51\\0{,}95\end{bmatrix}$$

In order to calculate the consistency index all elements of the weighted sum matrices from (3) are divided by its respective weight (see Tabel 5.3) and finally calculating the average:

$$\lambda_{max} = \frac{\frac{0{,}60}{0{,}198} + \frac{1{,}51}{0{,}490} + \frac{0{,}95}{0{,}312}}{3} = \frac{3{,}03 + 3{,}08 + 3{,}05}{3} = 3{,}054$$

$$CI = \frac{\lambda_{max}\text{-}n}{n\text{-}1} = \frac{3{,}054\text{-}3}{3\text{-}1} = 0{,}027$$

Calculating the consistency ratio:

$$CR = \frac{CI}{RI} = \frac{0{,}027}{0{,}58} = 0{,}046$$

The CR value is less than 0,1, the pair-wise comparison is there for consistent and thus acceptable. Similar calculations are conducted on the sub criteria under each main criteria in order to obtain the weight. As presented in Table 5, 5 the criteria lead time (0,490) is the highest ranked, followed by order quantity (0,312) and service (0,198).

Table 5.4 Pair-wise comparison

Criteria	Sub criteria	Weight
Service (0,198)	Quality ranking	0,260
	Design capabilities	0,633
	Packaging and carrying capabilities	0,106
Lead time (0,490)	≤ 10 weeks	0,633
	10 <X< 20 weeks	0,260
	≥ 20 weeks	0,106
Order quantity (0,312)	≤ 500	0,633
	500 <X< 700	0,260
	≥ 700	0,106

CR (main criteria) = 0,046 CR (sub-criteria) = 0,033

Weights given each supplier are a total sum of weights from the sub-criteria's. This is based on what the supplier can offer. As seen in the Table 5.5 supplier from Turkey has 71% while the supplier from China has 28 % making the supplier from Turkey a more preferred choice based on service, lead time and order quantity.

Table 5.5 AHP results

Supplier	Weight
China product A	0,28
Turkey product A	0,71

5.3. Cost Analysis

The TCO model was developed based on selected costs acquired within the material flow between supplier and Ellos. When sourcing from **China** see Figure 5.2, the material flow initiates at the production with a lead time of 14 weeks. Kering takes care of the quality control at the supplier to ensure the quality which is a cost factor that happens before DC. The goods are sent with trucks to the nearest harbour and loaded into a vessel and this includes handling and customs cost factors. Thereafter the goods are shipped to Gothenburg harbour with a lead time of 6 weeks. In Gothenburg harbour the goods are handled, which is a cost factor. It is thereafter transported through road transport with truck to the inventory in Borås. This includes the total cost before DC. Costs after DC include activities such as handling and inventory.

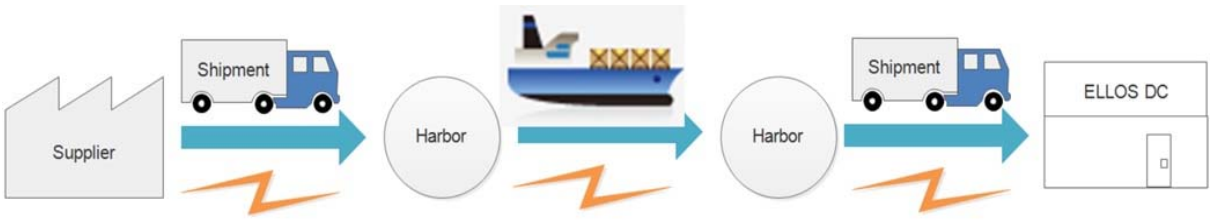

Figure 5.2 Material flow from supplier in China to Ellos

The material flow from the local supplier starts at **Turkey** see Figure 5.3 where the production lead time is 8 weeks. The loading and unloading of the truck is a handling cost

including labour cost. Kering takes care of the quality control at supplier which is a cost activity. The transportation is through road with truck the whole way to Borås inventory with a lead time of 1, 5 weeks. All of the cost before inventory is cost before DC. The information flow starts with Ellos and goes both ways in both flows.

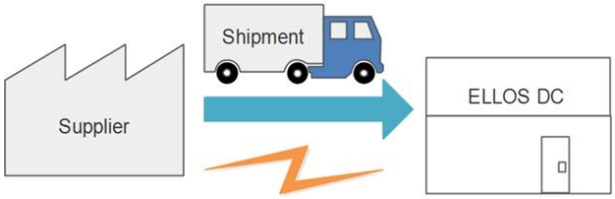

Figure 5.3 Material flow from supplier in Turkey to Ellos

The cost chosen for this cost model is the cost making the most impact. TCO is an approach which requires an identification of costs that are of importance in the acquisition, possession, use and disposition of goods for the buying company (Khurrum & Faizul, 2002). The identification of the cost was compiled together with Sandell and Hellgren during a discussion forum in order to understand the impact these cost had on the use of the goods for Ellos and the fast fashion segment. These cost factors are divided into total cost before and after the distribution center (DC), see Figure 5.4. The reason to dividing the cost into before and after DC is to achieve a better insight on how the costs differentiate. Two similar product types from the fast fashion segment, jersey in all colours (product a) and jersey with foil print (product b). The suppliers representing the global and local market are based in China and Turkey.

Costs (SEK)	China Product A	Turkey Product A	China Product B	Turkey Product B
Tender price/item	61,47	91,05	51,44	87,67
Customs	7,38		6,17	
Transportation	1,23	1,82	1,03	1,75
KGS commission	3,69	5,46	3,09	5,26
QC before DC	-	-	-	-
Total Cost before DC	**73,76**	**98,33**	**61,72**	**94,68**
QC after DC	-	-	-	-
Handling	6,16	6,16	6,16	6,16
Inventory	3,25	1,63	3,25	1,63
MOQ Surplus	-	-	-	-
Product discount	12,29	13,66	10,29	13,15
Total Cost after DC	**21,70**	**21,45**	**19,70**	**20,94**
Lead time (weeks)				
Production	14	8		
Transportation	6	1,5		
Total	20	9,5		

Figure 5.4 Breakdown of TCO

Cost factors that are included in the total cost before DC are as following:

Tender price/item (SEK): The tender price is divided into material, labour and administration cost in order for the company to have an overall view of each separate cost. However in this case an overall tender price was given. The cost model uses two currencies, euro for Turkey and dollar for China. These currencies are converted to SEK depending on the exchange rate.

Customs: Customs from China is 12 % of the tender price/item, however there are no customs in Turkey. This cost factor is very interesting because all countries have different customs and 12% and 0% may make a big difference on the final cost.

Transportation: Transportation is 2 % of the tender price/item for both suppliers. The transportation cost is the cost of transportation from supplier to DC. Although the percentage of transportation cost is the same for both suppliers, the cost is higher from the supplier in Turkey is higher due to the tender price in Turkey. This is a very normal cost to consider, transportation is often considered as a significant part of the total cost.

Kering global sourcing (KGS) commission: Kering handles most of the supplier selection for Ellos. For this service they take a 6 % commission of the tender price. In this service quality control is included.

***Quality control (QC) before DC*:** If Kering is not in charge of the supplier selection, the 6 % commission is not included. The QC cost will then be included. QC before DC is conducted by an external company that collects 0, 50% of tender price/item.

Cost factors that are included in the total cost after DC are as following:

Quality control (QC) after DC: If the QC is not done externally before DC it will be conducted after DC internally by the company and is 1 % of the tender price/item.

Handling: Handling of the products after DC is a fixed price. Handling includes labour cost which is quite high for Ellos making handling an important cost to consider.

Inventory: The inventory cost is based on the time the product is in inventory (inventory turnover rate), the uncertainty cost and the lead time. The inventory cost for Turkey is lower as the turnover rate is higher due to the shorter lead time. Inventory cost was chosen because it makes a great impact on the total cost.

Minimum order quantity (MOQ) surplus: If the MOQ is higher than the desired need, the excess products would result in a surplus. This surplus is calculated by taking 50 % of the tender price/item, multiplied with the excess. This is then divided by the whole order quantity. This cost is a huge problem for Ellos. Most of the Asian suppliers have high minimum quantities which may result in excess of products which is huge waste.

Product discount: Product discount is an estimation of the cost of products that may be sold on sales. The estimation cost is at 20 % of the tender price/item for China and 15 % for Turkey. This is a distinctive problem for Ellos. They have a lot of excess product which they are forced to sell on discount.

The cost before and after DC are enumerated, resulting into in the total cost/item. The total cost/item multiplied with the order quantity will present the total cost of the whole order.

Gross Margin is calculated by subtracting the total cost/item from the consumer price. The result is then divided by the consumer price.

5.4. Cost and benefit diagram

By combining the final results into a diagram an overall visual result is provided and the suppliers can be evaluated based on cost and benefits.

Cost could be used as one of the main criteria in the AHP model however a mix of TCO which consists of quantitative data and AHP considering and weighing qualitative data gives a better overview. By using a cost and benefits diagram (see Figure 5.5) Ellos will be able to see the benefits a supplier can offer towards cost thus determine if they should source locally or globally. The result from the cost vs. benefits diagram visualize a marginal differences regarding cost however the benefits will be much higher choosing a supplier from Turkey, therefore it is important to consider suppliers that cost more, as more benefits are obtained in form of qualitative factors, that in the end may diminish the cost as well. If there are many suppliers it will be easier to weigh them against each other based on cost and benefits and find the one supplier that will offer Ellos the best choice.

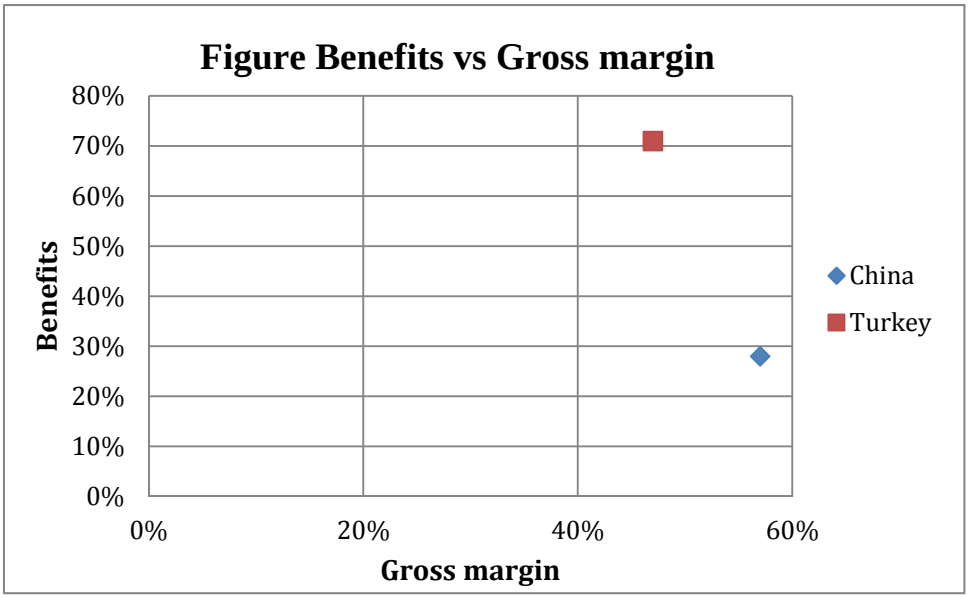

Figure 5.5 Cost and benefit diagram

6. Discussion

The purpose of the thesis was to identify selection criteria for supplier selection and to develop a sourcing model for selection of supplier for Ellos. The sourcing model was used to support a decision on what supplier to use, a supplier located in Turkey or a supplier located in China.

The methods for supplier selection AHP and TCO was used to identify and weight selection criteria as well as develop a sourcing model and was found to be appropriate methods for the task on hand. By using the AHP model it was possible to look at other aspects apart from COGS by taking qualitative factors into consideration. With the TCO model there was less focus on COGS and more focus on different cost factors. With the confirmed cost factors finalised it was assumed that the supplier sourced from Turkey would be higher in cost when analysing the gathered data. It was therefore interesting to discover that the cost factors where moving more to a breakeven point, meaning the difference in cost between the suppliers was reduced further up in the supply chain. Even though the costs centres moved towards a breakeven point, the global suppliers from a cost perspective are lower in cost (see Appendix A). All percentage based factors such as transportation, customs, KGS commission, QC, product discount and MOQ were connected to the tender/price, affecting the final cost. This percentage lead to higher cost for products sourced from Turkey. However, there are factors that contribute to that the total cost from Turkey and China would differ less. Such as no customs for Turkey while as China has a 12 percent customs. Inventory is less costly per item for products sourced from Turkey due to the shorter lead time, creating more security and less tied up capital. The results from the TCO presented less costs and a higher gross margin from products sourced from China, therefore it would be more beneficial to source from China when considering only the quantitative selection criteria. However, as mentioned by Ellram (1994) the great benefit with TCO over supplier selection methods such as AHP is that the TCO considers costs associated with supplier performance. Furthermore, it is also stated by Khurrum & Faizul (2002) that the TCO model may vary both between and within companies depending on the analysed item. A conclusion from the thesis is that the developed TCO model is suited for the fast fashion products but can also be used to analyse other product segment with some adaptions.

The selection criteria chosen for AHP, service, lead time and order quantity were chosen based on the fashion products. According to Fisher (1997) it is important to have the right supply chain for a product. According to Mason-Jones et al (2000) it is more beneficial to have a responsive/agile supply chain when dealing with fashion products. Based on this argumentation the selection criteria for AHP, minimum quantity and lead time were chosen for flexibility and responsiveness. The chosen categories and subcategories in AHP can be suited to all departments and segment, however for example outerwear, the lead time is of less importance while quality is much more important.

According to Tahriri et al. (2008) it is important to have a correct trade-off between qualitative and quantitative factors in order to select the right supplier. When conducting the

pair-wise comparison between criteria, trade-offs were necessary in order to conclude the most optimal supplier. When rating the different selection criteria in pair-wise comparison (Benyoucef et al, 2003), the results showed that for fast fashion products, lead time and minimum quantity where much higher rated than service (Table 5.1). According to the alternatives, supplier China and supplier Turkey, weighting the sub-criteria, supplier from Turkey has a weight of 71% and supplier from China has a weight of 28%, (Table 5.2). The weighting can be biased which can be a negative aspect. The AHP model can be time consuming if there is too many criteria which also was stated by Benyoucef (2003).

One surprising finding was the selection criteria, service, compared to lead time and minimum quantity was not considered as important and had quite low rating. This may of course be discussed that Ellos considers the service level of their supplier as a demand and all of their supplier has equal level of service. Another argument when looking into the sub-criteria of service for example quality is that fashion clothes has short life cycles which is an innovative product and according to Fisher (1997) innovative products have a short life cycle and unpredictable demand. The clothes may not need to be of highest quality because the fashion will "die out" and the consumers will throw away these clothes. When comparing the variety of selection criteria in Table 2.1 from the theoretical framework, quality was mostly ranked as the first most important selection criteria, which our study differs from.

Another surprising finding is that even with the increased importance of sustainability (Mehregan et al., 2014) Ellos did not consider this as one of the most important selection criteria. Especially within the fashion industry, the customers are increasingly aware of the brand. Company are dependent on their work with sustainability (Caniato et al., 2004) Ellos wants to strengthen their fashion brand and a way would be to include sustainability as a selection criteria. This reflects Ellos as a fashion company, as sustainability is not considered as high as price, quality and lead-time. In this case, sustainability would have even greater importance due to the selection between a global or local supplier. In addition, as Van Weele (2010) stated there is more transparency nowadays and Ellos suppliers are a part of their supply chain and reflects Ellos and their brand. A scandal could destroy the brand reputation and would be difficult to restore. Thus, Ellos not choosing sustainability as selection criteria shows lack of interest.

One interesting aspect with the analysis is when using AHP, considering the qualitative selection criteria, a different final result is generated compared to TCO. Since the AHP is subjective, the result may vary while the TCO is objective and not affected by personal preference. Thus the importance of experienced personnel to carefully select and structure the analytical hierarchy tree. Although the development of the AHP model was done with the guidance of the supervisor at Ellos combined with theoretical studies, studies on other companies could have provided increased reliability and validity of the thesis.

The percentage from the weighing of both suppliers was used in the cost vs. benefit diagram in order to compare the benefits deriving from both suppliers towards the cost. It's a trade-off between cost and benefits. (Tahriri et al., 2008) The model does not show the cost savings

that the benefits will lead to only the positive aspects. Positive aspects that are not shown in the diagram are such as; the flexibility of having a lower minimum quantity leads to less cost in form of diminished tied up capital resulting into less product discount, where Ellos needs to sell products on sale. Another positive aspect is to have shorter lead time from supplier to Ellos. A shorter lead time, would make Ellos more responsive towards customer demand. Furthermore, the shorter lead time would result in less tied-up capital and a higher inventory rate. With fast fashion products it is vital to be responsive and flexible in order to be available to market due to the time limitation of the products.

The sourcing model can also be used when comparing different suppliers situated within the same country. In this case the TCO would most likely be quite equal due to similar cost factors such as for instant customs and therefore not crucial for the supplier choice. The AHP on the other hand would in this case be more crucial for the supplier choice when comparing supplier selection criteria as it provides more insight on qualitative factors.

Whilst conducting the case study an insight on the purchasing process within the company was obtained. Figure 4.2 is an overview of the purchasing process at Ellos, which included all activities described by Van Weele (2002). This process looks different when differentiating between products sourced directly through Ellos and those sourced through the buying offices. Although the purchasing process was not the main focus of the study, it could be of interest for future research as it would enable a more in-depth analysis. Lastly, the models were developed with the guidance of the supervisor at Ellos. If done differently, studying and analysing other external companies with a similar supply chain could have increased the validity of the thesis.

7. Conclusion

The purpose of the thesis was to investigate selection criteria for supplier selection and develop a sourcing model for the selection of suppliers. The developed model was applied to support the decisions from where to source two identical products, from a supplier in Turkey or from a supplier in China. In order to fulfil the purpose, four research questions were formulated and served as a base for identifying interesting supplier selection criteria that are essential for Ellos based on fast fashion.

The qualitative supplier selection criteria that were identified for Ellos' two fast fashion products were lead time, minimum quantity and service. Lead time and minimum quantity are both important criteria for a company to be responsive which is essential when it comes to fast fashion. The supplier selection criteria, service, may be of higher importance at other departments however compared to lead time and minimum quantity it fell short. The local supplier based in Turkey offered shorter lead time and a lower minimum quantity, were it would be more beneficial for Ellos to source locally based on the selected supplier selection criteria. Quantitative selection criteria that were identified; costs, divided in TCO, were a selection criteria which were not weighted. Cost as selection criteria is commonly used and often considered the most important criteria, it is essential to consider it in the sourcing model.

The sourcing model consists of the TCO and AHP model, resulting in the summarized cost and benefits diagram, compiling an overall combined view of both the qualitative and quantitative factors regarding supplier options. This diagram based on the discussions shows the conclusion that it is beneficial for Ellos to source locally, from Turkey, when it comes to the two fast fashion products. The AHP model that has been used as a tool to weigh the essential selection criteria for supplier selection has the benefits to visualize the importance of different qualitative factors. By not only focusing on cost factors a holistic view of the supplier is created, enabling a better comparison between suppliers. Although AHP can be used as a tool to evaluate suppliers, it needs experienced personnel to carefully select structure and make pair-wise comparisons of the criteria. Furthermore, it can be time consuming if to many criteria are included, which in return could result into the model not being useful if the users find it too demanding.

The contribution of this thesis has been to offer Ellos a sourcing model to select suppliers for two fast fashion products sourced from two different suppliers located in different locations. This model can be applied on other departments but it needs to be adapted.

It can be concluded that the incorporation of qualitative factors when evaluating suppliers may have an effect on the final decision when evaluating suppliers opposed to basing the decision merely on cost. As TCO tends to focus on price and not qualitative factors, AHP was proven useful in cooperating selection criteria forcing trade-offs in order to select the optimal supplier.

When developing the sourcing model dimensions of sustainability were not incorporated into the selection criteria. Suggestions for future research would be to investigate the impact sustainability has on other selection criteria and how it can be incorporated within a sourcing model. With consumers being more conscious about the product and the impact scandals may have on company brands, dimensions of sustainability need to be put into consideration.

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Appendix A – Total cost of ownership

Costs	China Product A	Turkey Product A	China Product B	Turkey Product B		China Product A	Turkey Product A	China product B	Turkey Product B
Tender price/item SEK	61,47 kr	91,05 kr	51,44 kr	87,67 kr					
Customs	7,38 kr	- kr	6,17 kr	- kr					
Transportation	1,23 kr	1,82 kr	1,03 kr	1,75 kr					
KGS commission	3,69 kr	5,46 kr	3,09 kr	5,26 kr					
QC before DC	- kr	- kr	- kr	- kr	**Total cost before DC**	73,76 kr	98,33 kr	61,72 kr	94,68 kr
QC after DC	- kr	- kr	- kr	- kr					
Handling	6,16 kr	6,16 kr	6,16 kr	6,16 kr					
Inventory	3,25 kr	1,63 kr	3,25 kr	1,63 kr					
MOQ Surplus	- kr	- kr	- kr	- kr	**Total cost after DC**	21,70 kr	21,45 kr	19,70 kr	20,94 kr
Product discount	12,29 kr	13,66 kr	10,29 kr	13,15 kr					
Total/item	95,46 kr	119,78 kr	81,42 kr	115,62 kr					
Number of items	2000	2000	1700	1700					
Total cost	190922,00 kr	239555,62 kr	138415,87 kr	196550,52 kr					
Consumer price	224,00 kr	224,00 kr	249,00 kr	249,00 kr					
Gross Margin %	57%	47%	67%	54%					

Lead time (through put time) weeks	China Product A & B	Turkey Product A & B
Production	14	8
Transportation	6	1,5
Total	20	9,5

Appendix B- Questionnaire

1. How does the supplier base look like today?

2. What kind of relationship does the company have with their suppliers, long-term relationship or short-term relationship?
    - What determines the sort of relationship towards the supplier?

3. When choosing supplier what parameters are used? What type of sourcing model is used?
    - What is the purchasing process?
    - Is this a standardised process? What impact does an individual have on the process (organisational behaviour)?

4. What key performances are used to evaluate suppliers?

5. How does Ellos create their forecasts?
    - How do they work towards the forecasts? What´s the forecast error?

6. What is the lead time?
    - What margins in delivery time are used?

7. What is the current return to your suppliers? (On-time delivery, lack of quality)
    - What is the cost of return to supplier?

8. What is the transaction cost?

9. How will the change from push to pull be implemented?
    - Is it to go through the whole supply chain from customer to supplier?
    - Would the pull method apply on all collections, bas and the limited?

Appendix C - Questionnaire

1. What kind of relationship does the company have with their suppliers, long term relationship or short term relationship?
    - What determines the sort of relationship towards the supplier?

2. When choosing supplier what parameters are used? What type of sourcing model is used?
    - How does the purchasing process look like?
    - Is this a standardised process? What impact does an individual have on the process (organisational behaviour)?
    - How big impact does the purchaser have in the purchasing process?

3. What issues are experienced with today's way of working?
    - What kind of improvements have already been done to handle it?
    - What improvement could be implemented?

4. How do you follow up your suppliers, in term of how they meet up to company requirements?