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MSM Master's Thesis

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Key Factors in SME supply chain risk assessment

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Tiivistelmä

Hankintojen riskienhallinta on kasvattanut merkitystään yritysmaailmassa ja tieteenharjoittajien parissa. Työn tarkoitus on tutkia keskeisiä tekijöitä jotka vaikuttavat PK -yritysten hankintojen riskienhallintaan arvioimalla suomalaisen tuotanto-alalla toimivan, globaalia kauppaa käyvän, PK -yrityksen hankintoihin liittyviä riskejä kokonaisvaltaisesti. Riskien arvioimiseen käytetään Risk Assessment Modelia, jonka perusteella havainnoidaan alan parhaita käytäntöjä sekä liiketoimintaan liittyviä piileviä riskejä.

Ensinnä työ identifioi tärkeimmät käsitteet aihepiiriin liittyen kuten hankintojen johtaminen, PK -yritys, neuvotteluvoima, kumppanuus, riippuvuus ja hankintojen kokonaiskustannus. Lisäksi työ käy läpi Lean Managementin ja riskienhallinnan pääpiirteet. Tämän jälkeen työ esittelee oleellisia tutkimuksia aiheesta, jotta lukija saa oikeellisen kuvan pk -yritysten riskienhallinnan nykytilasta.

Tämän jälkeen työ keskittyy tarkastelemaan case -yritystä löytääkseen aiempaa tutkimusta tukevia löytöjä. Case -yrityksen arvioinnin jälkeen, työssä vedetään yhteen samankaltaisuudet ja eroavaisuudet, case -tutkimuksen sekä aiempien tutkimusten välillä.

Tutkimuksen tärkeimpiin löydöksiin kuuluu, että käytännössä usein opportunisti vaikuttaa merkittävästi arvoketjun kykyyn luoda lisäarvoa ja estää tätä näin ollen kasvamasta täyteen potentiaaliinsa. Lisäksi tutkimustulokset kannustavat yrityksiä implementoimaan Lean filosofiaa käytännön tuotannonohjaukseen, jotta yritys kykenee hallitsemaan itseensä kohdistuvia riskejä optimoimalla varasto-arvonsa ja näin maksimoimaan kassa-arvonsa. Näiden lisäksi yritysten tulisi panostaa arvoketjunsä syvälliseen ymmärtämiseen, kyetäkseen allokoimaan resurssinsa tehokkaimmalla mahdollisella tavalla.

Abstract

Supply risk management is an issue of increasing importance amongst many companies as well as scientists. The aim of this thesis is to explore the key factors in SME supply risk assessment by assessing the supply risks of a Finnish manufacturing SME operating in a global value chain. The thesis will apply the Risk Assessment Model in order to gain valuable information of the supply chain environment of the case company for further evaluation of best practices and hidden threats.

Firstly the thesis will identify key concepts regarding the research including supply chain management, SMEs, negotiation power, collaboration, dependency, TCO and cost management. In addition the thesis will briefly introduce the main dimensions of lean and risk management. Secondly the thesis will introduce relevant researches regarding SMEs and risk assessment in order to create an accurate image of the state of contemporary SME risk assessment and supply chain environment.

The thesis will then conduct the case study to obtain further knowledge on the topic in order to gain consolidating information for the findings of the thesis. The fourth chapter will then review both the findings of contemporary researches and the case company assessment and seek to find similarities and differences.

The findings of the thesis conclude that opportunism deteriorates the efficiency of value chains and prohibits them from reaching full potential. The findings of the thesis also encourage to implement lean to further manage and tackle supply risks. In addition the thesis suggests that companies should emphasize and deeply understand their supply chain in order to allocate their resources accordingly and better understand the sources of potential supply risks.

1. Introduction

The world is moving towards an ever increasing globalisation leaving businesses more vulnerable for global competition. On the other hand increased globalisation has also opened a window of global trade for companies that before have not had resources to operate on a global scale. This change in global business dynamics enables SMEs to compete on global markets as well as purchase from suppliers operating around the world. The world of global sourcing and supply chain management of large corporations and multinational companies has been thoroughly reviewed by academics the world over. The key aspects of the main supply chain managerial disciplines have been integrated as part of the organization processes and with other organizational management in the businesses worldwide (Surowiec 2015).

Since the majority of businesses worldwide are identified as SME businesses it is useful to review the supply risk environment of SMEs operating on global markets. SMEs might not be able to implement supply managerial theories in the same extent as larger companies due to various reasons. Factors such as negotiation power, dependency and partnering factors may vary between large companies and SMEs. The objective of the thesis is to identify key factors of supply chain risk assessment for SMEs.

Complex supply chains that are commonplace in today's business world can create serious risks for companies and their supply chains (Lintukangas et. al 2014). The thesis is keen on finding out the main key factors of risks and restrictions but also possible identifiable benefits SMEs have in this regard. The thesis will introduce the main parameter regarding the domain of supply risk assessment, assess some of the contemporary theories and studies regarding this topic and conduct a case study on a Finnish manufacturing SME operating its supply management and sales on global markets. On the implications found on the conducted research the thesis will seek to gather justifiable managerial implications useful for practitioners and researchers.

1.1. Background

The thesis is interested in studying the environment of global SMEs in terms of their ability to implement theoretical supply management methods. The implementation will be evaluated by retrieving qualitative information from academic reviews about supply chain management parameters such as *negotiation power, dependency, partnering factors* et cetera.

Besides retrieving data from the theoretical frame of the supply risk assessment, the thesis will take an insight look at a Finnish manufacturing SME company that operates on a global scale in a small niche market. The discussions with the company will evolve around their ability to be a market leader and stay competitive despite increased global dimension of competition in the market. This has a lot to do with their supply management from how they supply their bulk components at the lowest possible price, to choosing key suppliers between local key suppliers and suppliers from low-wage countries.

The thesis is motivated to find out how SMEs conduct their supply chain management and how do they implement theoretical supply chain doctrines in practice. The thesis is also keen on finding managerial implications and best practices from the theories and theoretic disciplines of supply chain management for SMEs in order to better understand the conditions small and medium sized businesses are operating in. The thesis will be conducted on a supply risk assessment point of view. The risk assessment viewpoint is applied in order to grasp the reality under which most SMEs operate in - scarce resources require companies to carefully weigh in the opportunities and risks in conducting their business. In order to make consistent and successful decisions the management has to understand the possibility and the potential impact a certain risk carries. Due to the before mentioned the thesis seeks out to understand SME supply management on a risk assessment perspective. The research question of the thesis is: *What are the key factors of supply chain risk assessment within a SME operating on global markets?*

The thesis will limit to assessing risks around SMEs. The thesis is also limited to assessing supply risks and it will serve as a viewpoint of which the thesis is conducted. The thesis is in addition keen on assessing the supply risks of SMEs that are operating

in a global value chain. The global value chain aspect is considered to imply that the company is operating its supply management and/or its sales on international markets. In other words the thesis concentrates on finding supply risks and consequences on a holistic view within the domain of a SME operating on international markets.

1.2. Research methodology

The thesis will employ its research by using *qualitative methods* to better understand the nature of supply management of SMEs. Qualitative research is applied in attempts to gain useable information and pointing out practical issues of the research object. Qualitative research, as a method, employs many different theoretical disciplines, e.g. both in social sciences and natural sciences but also in less theoretical contexts such as market research et cetera (Denzin & Lincoln 2005).

According to Hirsjärvi et al (1997) the idea behind qualitative research is to concentrate on representing *real life* occurrences. This implies that the nature real life is complex and correlative actions and reactions shape the reality where the aim of qualitative research is to create as *holistic* picture as possible of the reality that it is examining.

Denzin & Lincoln (2005) define qualitative research as an interpretive naturalistic approach to reality. This contains that qualitative researchers study the research objects in their natural settings, attempting to make sense of or interpret phenomenons in terms of the meanings people bring to them.

In addition Hirsjärvi et al. (1997) state that the the general aim of qualitative research is to find and unveil *new facts* instead of proving or further consolidating existing theoretical claims and results. Therefore qualitative methods suit this thesis particularly well due to the fact that it leaves room for interpretation and for holistic review of phenomenons and causalities between them.

Quantitative research methods on the other hand are more suitable for researches where vast quantities of information would be available and used to gain data and knowledge on the topic in general terms. According to Hirsjärvi et al. (1997) quantitative research at it's best aims to obtain generalizing conclusions. In other words qualitative research methods are more suitable for this thesis than quantitative

methods that acquire large amounts of data for its generalizations. The thesis will be executed by reviewing the theoretical frame of the topic after which a case study will be conducted on a Finnish manufacturing SME operating in a value chain. Due to the limited case research data quantitative research method is not an ideal method for conducting the thesis.

After briefly explaining the key concepts, the thesis will present theoretical researches conducted on the topic. This *secondary material* (Hirsjärvi et al. 1997) will serve as a structure of this thesis upon which the *primary material* (Hirsjärvi et al. 1997), extracted from the case company, will be compared to and analysed in the concluding chapters of this thesis.

The case study will be conducted by applying the Risk Assessment Model in a semi structured manner where the case company is given the Risk Assessment Model to answer to but also the opportunity to further explain the key points of their risk assessment in their own words. Qualitative methods will be used throughout the thesis in attempts to grasp a holistic view and to gain further knowledge about the key factors of SME supply chain risk management. The thesis will be concluded with a comprehensive summary of the findings as well as a chapter where the managerial implications are gathered as a shortlist in order to create a prompt summary of the thesis for the readers.

1.3. Key concepts

The thesis will examine the concepts of global sourcing, supply chain management and SMEs. In this chapter the key concepts of the thesis will be defined and shortly explained.

The key concepts are as follows: supply chain management, small and medium-sized enterprises, negotiation power, collaboration and dependency. These will be defined in a more general manner with key issues explained for better understanding of the thesis. Total cost of ownership (TCO) is a key feature in contemporary supply chain management theories and is therefore explained briefly in a definitive manner as well as information about TCO as a model and cost management in general.

A key concept of the thesis is the prevailing supply chain management concept, *lean*, which will more thoroughly explained in the theoretical frame chapter due to the complex nature and its holistic presence in a company that is implementing lean.

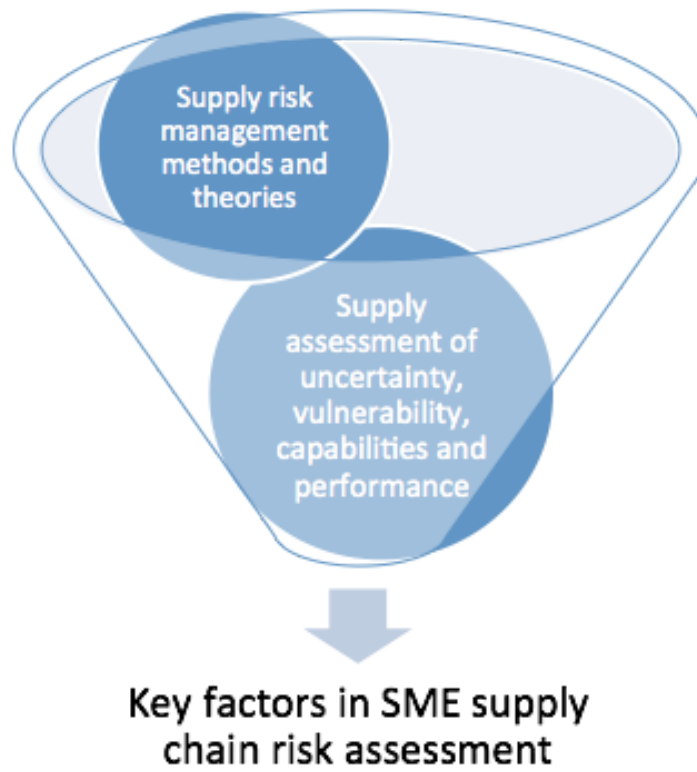
The theoretical framework of Risk management and assessment is also defined and explained since it is an integral part of both theoretical and empirical supply chain management. The part will contain general steps for a company to manage and assess risks in their business environment. This concept is situated in the theoretical chapter due to its holistic nature and importance to this thesis.

Conceptual Framework

The conceptual framework of the thesis consist of assessing *supply risk management methods and theories* such as lean management and risk management as well as key concepts such as negotiation power, collaboration, dependency and cost management in order to gain basic knowledge on contemporary theoretical supply chain disciplines applied in businesses and used in various processes.

Moreover the conceptual framework includes *theoretical reviews and studies of supply risk assessment* which consist of contemporary theoretical studies and reviews on the topic which are intended to allow the reader of this thesis a general view on the topic of SMEs operating as a part of a supply chain and how these companies can and do assess risks in regards to the aforementioned. This theoretical frame serves as *secondary material* (Hirsjärvi et al. 1997) upon which the findings of the *primary material* in the empirical part will be compared to and assessed.

1. Figure. Conceptual Framework



Small and medium-sized enterprises

Small and medium-sized enterprises (SMEs) are defined in the EU recommendation 2003/361.

The main factors determining whether an enterprise is an SME are:

- 1 staff headcount and
- 2 either turnover or balance sheet total.

1. Table (European commission 2003)

| Company category | Staff headcount | Turnover | or | Balance sheet total |
|------------------|-----------------|----------|----|---------------------|
| Medium-sized | < 250 | ≤ € 50 m | | ≤ € 43 m |
| Small | < 50 | ≤ € 10 m | | ≤ € 10 m |
| Micro | < 10 | ≤ € 2 m | | ≤ € 2 m |

These ceilings apply to the figures for individual firms only. A firm that is a part of a larger group may need to include staff headcount/turnover/balance sheet data from that group too. (European Commission 2003)

This thesis will be referring to micro, small and medium-sized businesses as SMEs since this perhaps is the general perception of small and medium-sized businesses. Therefore there is no need to confine micro businesses outside the definition of SMEs due to the purposes of this thesis.

Negotiation power

Negotiation power or bargaining power plays a part in every business negotiation and is a key element when discussing the dynamics of supply chain management. Negotiation power certainly can be seen explaining much of the success or shortcomings of a supply chain management operation. Negotiation power can enable

a supply management team to more freely dictate the rules of a supplier relationship and therefore lead into a more fruitful relationship for the buyer.

Kuhn et. Al (1983) thoroughly defines the concept of bargaining power as following: "We may define bargaining power (of A, let us say) as being the cost to B of *disagreeing* on A's terms relative to the costs of *agreeing* on A's terms ... Stated in another way, a (relatively) high cost to B of disagreement with A means that A's bargaining power is strong. A (relatively) high cost of agreement means that A's bargaining power is weak. Such statements in themselves, however, reveal nothing of the strength or weakness of A *relative* to B, since B might similarly possess a strong or weak bargaining power. But if the cost to B of disagreeing on A's terms is greater than the cost of agreeing on A's terms, while the cost to A of disagreeing on B's terms is less than the cost of agreeing on B's terms, then A's bargaining power is greater than that of B. More generally, only if the difference to B between the costs of disagreement and agreement on A's terms is proportionately greater than the difference to A between the costs of disagreement and agreement on B's terms can it be said that A's bargaining power is greater than that of B."

A more summarized definition would be: "Bargaining power refers to a bargainer's ability to favorably change the "bargaining set", to win accommodations from the other party, and to influence the outcome of a negotiation." (Yan & Gray 1994)

This clearly states that the bargainer with more negotiation power can change the outcome of the negotiation better suitable for himself. As mentioned before this will enable the SCM operation to better implement its SCM doctrines to its suppliers.

Stannack (1996) on the other hand describes *purchasing power* as ability to gain successful results in negotiations and contracts for the company. Purchasing power can be seen as a indicator of negotiation power of a SCM operation.

Collaboration

Collaborative partnership or collaboration or partnership is a way for the buyer and supplier to engage in a series of actions that would result in a mutual economic gain for both parties of collaboration. Collaboration enables information sharing, planning and re-engineering of the supplied products or services when seeking competitive

advantages, instead of opportunistic behavior and short-term advantages regarding e.g. price, delivery and payment terms.

Eisingerich & Bell (2008) defines collaboration as: “Collaborative partnerships in business benefit from the close, trusting relationships between partners. Network strength and openness create profits amongst businesses that have created trust between them. Collaborative partnerships between businesses generate higher levels of productivity and revenue when there is stable, bidirectional communication between parties.”

Based on the definition, collaboration can be seen as a contractual partnership between a buyer and supplier that is designed to create profit via e.g. information sharing and openness. In an ideal situation the buyer and supplier would share information on e.g. production, demand and R&D without opportunistic behavior thus leading to increased profits for both parties. Collaborative partnership is therefore a way of enhancing the company’s overall performance by creating a win-win situation between the buyer and supplier. This can be seen to be different from and traditional “arms length” relationship between a buyer and a seller.

According to McDonald (1999) a balance in power is the best setup for collaboration to happen. This is due to the fact that when power balance exists both parties are more likely to comprehend the possible gains of collaborative actions. On the other hand in a situation where the majority of power is possessed by one party opportunistic behavior is more likely to occur.

Dependency

Dependency can be seen as a key success factor in a buyer-supplier relationship. Pfeffer & Leong (1977) states that: “power and dependency go hand in hand.” This meaning that the party with less dependency on the other party, will most like have more power over the other one when negotiating term and conditions of a buyer-supplier relationship. Dependency being power, it could be seen important for a company to have multiple choices whether it is suppliers or buyers. This will decrease dependency and increase power since the company will have substitutive alternatives to negotiate with if status quo is unsatisfactory.

Medcof (2001) draws parallels between power and dependency by stating that power of an organization depends upon its resource-dependency relationships with other organizations. This can be understood in the way that organizations have varying dependency on various resources they have to acquire. In other words companies that source mainly bulk components are more likely have more power than companies that have to source complex components with scarce supply. In the latter case the power would be on the side of the supplier(s) due to the relation between power and resource-dependency.

TCO and cost management

The concept of strategic cost management is well-known within theoretical business studies. Siferd & Ellram (1998) states that in its implementation cost management presents a viable tool for decision-making and that often companies approach strategic cost management either from financial and accounting perspectives or as that of the supply management. Furthermore the concept of total cost of ownership (TCO), as they found it, is sufficiently reliable model to utilize within purchasing decision-making. TCO is a procurement tool, which assists in understanding costs of buying from a particular supplier (Moisello 2012). Other usage for the tool is to identify key factors, which could increase costs.

The purpose of TCO is to determine life cycle costs of a particular asset, e.g. purchase price, transportation to the sight of use and relevant logistic costs, maintenance, waste disposal etc. TCO considers both internal and external costs. Moreover, in order to build a TCO model value chain analysis, strategic positioning analysis and cost drivers are supposed to be considered and taken into account to some extent. (Siferd & Ellram 1998)

The TCO model presents clear information on determining low price and low cost suppliers. Due to the thorough cost analysis of the TCO model, Siferd & Ellram (1998) states that, it is designed to identify even seemingly surprising results such as: low cost supplier may have a higher direct purchasing costs, however, its maintenance costs could be far lower, which results in overall lower life cycle costs. The analysis of the

TCO model is influenced by the supplier's performance, as well internal operational and organizational efficiency.

TCO is designed to allow the company to obtain a holistic vision in order to accept e.g. higher direct purchase prices, by emphasizing other attributes, which can result in lower overall costs. TCO enables companies to analyze their relationships with suppliers from the economic effects perspective. Moreover, the TCO method puts emphasis on how supply costs may not entirely depend only on the product volume, but rather on supplier performance.

Snelgrove (2012) and Lawton (2004) both question TCO method as it does not actively measure value. Snelgrove (2012) stated that “supporting value pricing and sales with the right tools, processes and people enables you to present a premium-priced product to customers so that they see, realize and understand the reasoning behind the premium price and are willing to pay for it”. TCO shall be considered as a collaboration tool in some industries. In many industries, there are strict guidelines to follow, which are usually provided by a legislative or sanctioning bodies. Moreover, such guidelines provide a base for understanding what costs could be involved in operational activities.

1.4. Outline of the thesis

The thesis will gather insight information about the supply chain management operations and overall environment of the global sourcing operations for a typical small and medium-sized enterprises from the viewpoint of risk assessment. A special interest will be on finding out about supply chain management factors such as negotiation power, collaboration factors and buyer-supplier dependency. The thesis is interested to find key success factors for SMEs by assessing the risks of the company holistically using the viewpoint of risk assessment. The thesis is interested in unveiling ways a SME can compete on global markets. A crucial part of this is to master the supply chain in order to be level with the competition or to gain competitive edge on the competitors. The thesis is conducted by ways of qualitative research methods due to the pragmatic nature of the thesis which intends to give managerial implications to theories and research questions. Qualitative research methods allows the thesis to search causalities

between various phenomenons and factors more freely and therefore it is the method of choice for a thesis that seeks practical answers to theoretical questions.

The empirical part of the thesis will be executed by interviewing a case company, a Finnish manufacturing SME that operates on a global scale, by conducting the questions of The Risk Assessment Model in a semi-structured manner. After the risk assessment model is applied for the case company the thesis will examine the theoretical studies compared with the case company's findings of the empirical situation. The goal of the thesis is to find key factors of a SMEs supply chain management both theoretically and empirically. Furthermore the goal of the thesis is to find managerial implications on possibilities and possible best practices of SME supply chain management.

The thesis can be outlined as a thesis discussing the supply risk assessment SMEs operating on global markets. The main research question of the thesis is: *What are the key factors of supply chain risk assessment within a SME operating on global markets?* The second research question is: *are there identifiable key factors that a SME should take into account when conducting its supply risk management?* The third research question is: *are there best practices or guidelines on how to tackle the main supply chain risks from a managerial viewpoint?*

2. Theoretical frame of a SME supply risk assessment

The following chapter will be assessing the research conducted on the subject. The search has been conducted with key concepts and theories such as *risk assessment, SME, risk management, lean, TPS, negotiation power, dependency, TCO, collaboration and supply chain management*. The function of the following part is to give a brief overview of various key factors of SME supply risks as part of a global supply chain.

The overview of the theoretical research conducted on the topic is aimed to give a general view on some of the contemporary issues that SMEs face when operating in a supply chain. This *secondary material* (Hirsjärvi et al. 1997) will serve as a framework upon which the findings of the *primary material* in the empirical part will be compared to and assessed. These researches are sorted by topic under different sub chapters. These sub chapters represent different nuances under the main topic of SME supply risk assessment. For coherence these sub chapters are displayed in the same order and by same titles in chapter four where the findings of the secondary research material are compared to the primary case company material.

However first the chapter will define two key theories regarding the thesis; lean and risk management. Risk management is an integral part of this study and the main points of the concept should therefore be discussed. Another pivotal part of this thesis is the Japanese lean method for supply chain management. Lean methods seem to have become a household name in businesses of various sizes and to understand some of the main concepts and therefore main findings in this thesis, the main characteristics of lean are explained.

2.1. Lean management

Lean production and lean manufacturing are often referred as lean, which is a systematic method of eliminating waste within manufacturing. It also takes into account waste that is created due to unevenness in work loads and through overburden. The perspective of lean is that of the customer – value is created when producing something that the customer is willing to pay for. Essentially one could state that lean is intended to

show what adds value to the product and to reduce everything else. (Womack et. al 1990)

Lean is often seen as a set of tools to identify waste and assist waste elimination. There are various different similar tools that can be considered to be included in lean; for an example the Kanban system, a inventory control system, which looks to control the logistical chain from the viewpoint of production and is a method of achieving JIT (Just-in-Time). Basically Kanban is designed to align inventory levels according to actual consumption, therefore it is called a "pull-system", where the pull to manufacture comes from the demand.(Ohno 1988)

Another, and a more resource demanding approach to lean is the so called Toyota Way where the main focus is on improving the smoothness or "flow" of the work, by ways of eliminating unevenness particularly through the system and not the waste itself. Conducting this includes production leveling, pull-production (Kanban) and Heijunka Box, which is a visual schedule to demonstrate tables for production phases thus leading to smoother production flow. It is worth mentioning that the Toyota Way is a fundamentally different approach to many other methodologies and requires considerable measures in order to be successful thus leading to its unpopularity world wide. (Liker & Hoseus 2008) Both lean and the Toyota Production System (TPS) are connected as principles in the sense that both thrive to cost reduction by means of waste elimination and include pull processes (Kanban), perfect first time quality, waste minimization, continuous improvement, flexibility, building a long term relationship with suppliers and production flow.

TPS which is also known as the flexible mass production, is built on two pillar concepts; Just-in-time (flow) and smart automation (autonomation). According to the doctrine if production flows perfectly there should be no inventory. Also if the features that the customers value are the ones that the company is producing, the product design is simplified and all the effort is put into the features that are valued by the customer. The autonomation aspect is identified as automation with "human touch", this meaning that the automated systems are designed to assist humans at what they do best. (Suprateek 1988)

Therefore in the core of lean implementation is getting the right things to the right place at the right time in the right quantity in order to reach the perfect work flow, being

flexible and minimizing waste in the meantime. Thus it is important that the concepts of lean are understood and appreciated by the actual employees that build the products and therefore have the actual control over the processes and deliver the value. The cultural and ideological effects of lean might be even more important than the actual tools of production. Usually the weak results of lean implementation are due to weak organizational understanding of the concepts. The aim of lean is to make work adequately simple to both do and manage. Toyota has setup mentoring sessions, where it seeks to help its suppliers to improve their own production. The closest equivalent to this in the lean concept to the Toyota mentoring is a so called "Lean Sensei", where the companies are encouraged to work with unbiased third party experts on these issues. (Womack et. al 1990)

Spear and Bowen (1999) characterized the "Toyota DNA" as following:

Rule1: All work shall be highly specified as to content, sequence, timing, and outcome.

Rule 2: Every customer-supplier connection must be direct, and there must be an unambiguous yes or no way to send requests and receive responses.

Rule 3: The pathway for every product and service must be simple and direct.

Rule 4: Any improvement must be made in accordance with the scientific method under the guidance of a teacher, at the lowest possible level in the organization.

Various types of waste and the identification of them is an integral part of lean thinking, even though the concept of waste elimination might seem like a simple task. Toyota has defined three types of waste in order to reach lean's goal of waste elimination. These types are: muda (uselessness), muri (overburden) and mura (unevenness). The very key for a company is to establish distinctions between value-adding activity, waste and non-value-adding work. Non-value-adding work is waste which has to be done anyways under the current conditions. It is a key to be able to demonstrate these

non-value-adding parts in order to grasp how much savings can be achieved. (Ohno 1988)

The flow approach aims to achieve JIT by ways of removing variation out of the equation of the work schedule therefore providing a target for the application of various techniques. When attempting to achieve JIT many quality problems will arise explicitly due to the rigorous nature of JIT thus leading to pressure to solve these issues.

Lean tends to require such a rigorous commitment and questioning of the status quo in the company that it might be extremely difficult implementing into a firm. Although lean is not just about cutting costs, one of the breakthrough insights of lean is that majority of the costs are assigned in the design and development phase of the product. In Lean implementation the main perspectives for actions are divided into two categories; the Tools based approach and the Waste based approach.

The Tools based approach consists of emphasizing the mutual Lean vision of the senior management, identifying the Lean project leader and setting up the objectives. Then the Lean implementation team members are to be appointed and trained for Lean disciplines. Before the actual implementation to the whole of the organization, a pilot project for Lean implementation should be executed in order to find probable sources for problems that can be tackled and understood before the actual implementation of Lean.

The Waste based approach sets out to sorting out as many a quality, downtime and instability problems as possible. The task within the Waste based approach is to set up a flow through the system that seeks to avoiding variations in the work cycle. Therefore once the standardized flow has been established, this work pace and standardized work should be introduced to the workforce. In order to pull the work through the new system successfully Kanban cards in inventory and scheduling of work should be engaged in. During the implementation Lean tools are to be actively used to improve on exposed quality issues. An implication of the mindset of Lean's continuous improvement is that once the initial objectives has been met objectives should be increased and the process started over again by sorting out quality, downtime and instability problems. It should be understood that once lean ideology is implemented, the quality perspective is an ongoing process which is based on continuous development.

Even though the emphasis on the goals of lean vary between different authors, some of the the commonly approved more important global goals of lean are as following. *Quality improvement*, in order to be competitive on the marketplace and to meet the market requirements and customer expectations. *Waste elimination* is in the heart of Lean goals due to the profound notion of that waste does not add value to the product and therefore unnecessarily consumes resources. *Time reduction*, reduces excess time spent on manufacturing the product and reducing the cycle time of production is one of the most easily way of understanding the elimination of excess and adding efficiency. *Reduction of total costs* seeks to achieve the aligning of production according to customer demand, leading into decreased inventory costs. Optimizing production near to demand further consolidates the evenness of work principals.

2.2. Risk management

Complex supply chains that are commonplace in many modern businesses can create severe risks for companies and their supply chains. A significant supplier risk is a situation where the sourcing company is unable to control its independent suppliers. Since supply chain risks are often interrelated should these risks therefore be mitigated by mapping the root causes as high up the supply stream as possible in attempts to control these risks. (Lintukangas et. al 2014)

According to Hubbard (2009) Risk Management is by definition the identification, assessment and prioritization of risks by coordinated and economical application of resources in order to minimize, monitor and control the impact or/and probability of unfortunate events. The definition according to Antunes & Gonzalez (2015) in addition regards Risk Management as efforts to maximize opportunities in the manner that Risk Management's idea of risk reduction does not hinder the realisation of business goals.

Risks can derive from various sources such as uncertainty in financial markets, threats from project failures, credit risks, legal liabilities, accidents, natural disasters or even unpredictable root-causes. The philosophy of risk management consist of two types of events, risks are classified as negative and opportunities as positive. There are many various risk management standards developed including Project Management Institute, National Institute of Standards and Technology and ISO standards. (ISO/DIS 31000 2009, ISO/IEC Guide 73 2009) Hallikas et. al (2004) state that risks initiate from uncertainty and that two major sources of uncertainty in a business are customer demand and customer deliveries. These uncertainties are connected to the company's ability to manage costs, time and deliveries as well as confidential information.

Ideally risk management, a prioritization process, is done where the most probable and on the other the risks with most severe impact are identified and are dealt with first when occurring. Risks with lower probability and impact are handled in descending order. In practice it is difficult to rank the probability and impact of risks in a realistic order. Risks that are occurring all the time can be misunderstood due to lack of identification ability. An example of an unidentified risk could be an ineffective collaboration partnership or misinformation between the parties. Risks of these nature

cost the company by reducing the productivity of knowledge workers, reduce cost-effectiveness of services, quality, reputation, brand value, and earnings quality. (ISO/IEC Guide 73 2009)

Allocation of resources is another difficulty faced by risk management. The idea of resource allocation on the viewpoint of risk management are considered as opportunity costs. E.g. resources spent on risk management could have been spent on more profitable business operations. Therefore effective risk management minimizes spending of resources as well as minimizes the effect of risks. (ISO/IEC Guide 73 2009)

A risk is defined as something that is possible to occur and adversely affect the achievement of an event, therefore uncertainty is in the essence of a risk. Risk management systems can aid managers in grasping the reality of the risk surrounding the business. Every company has its own internal control systems and components, leading to different outcomes in their respective risk management efforts. An example of the framework for ERM components includes Internal Environment, Objective Setting, Event Identification, Risk Assessment, Risk Response, Control Activities, Information and Communication, and Monitoring. (ISO/IEC Guide 73 2009)

ISO 31000 (2007) identifies the principal tasks of risk management as following: create value, be an integral part of organizational processes, explicitly address uncertainty and assumptions, be part of decision making process, be a systematic and structured process, be based on the best available information, be tailorable, take human factors into account, be transparent and inclusive, be dynamic, iterative and responsive to change, be capable of continual improvement and enhancement and be continually or periodically reassessed.

According to ISO/DIS (2009) the process of risk management consist of half a dozen steps that include: The step one and two seek out to *identify* risks in a selected domain of interest and *planning* the remainder of the process. Third step is to *map out* the social scope of risk management, the identity and objectives of stakeholders and the basis upon which risks will be evaluated. Step four is about *defining* a framework for the activity and an agenda for identification. *Fifth step includes developing* an analysis of risks involved in the process. *Finally in step six the company should mitigate* risks by using available technological, human and organizational resources.

2.2.1.Risk identification

According to Lintukangas et. al (2014) risks are interrelated and “Risks can also be on various levels: macro-level risks include political and government, macroeconomic, legal, social and natural risks, meso-level risks e.g. project selection, finance, design and operation risks, and micro-level risks concern business relationships and third party risks.” Therefore in order to gain vital information of the risk environment of a company there should be sufficient resources used to unveil these risks as established in the following paragraph.

The step after establishing the context is to identify the potential risks surrounding the business operations. The risks are to be about events that, when triggered, would cause problems or benefits. Therefore risk identification can begin with identifying risks of the company or of competitors. Source analysis identifies the nature of the risk, which can be internal or external to the system that is being assessed e.g. : stakeholders of a project or employees of a company Problem analysis is keen on identifying threats, which are related to risks. These threats can be related to money loss, accidents et cetera. In scenario based risk identification, different scenarios are created in order to identify various objectives. All scenarios with undesirable outcomes are identified as risks. Taxonomy based risk identification is a sort of breakdown of possible risk sources. Based on the taxonomy and knowledge of best practices, a questionnaire is accumulated. The answers to the questions reveal risks of the business. Common risk checking is done by having a list for various risks for various situations. When the company is facing a particular situation, risks are checked from the list in order to have a clear understanding of nature of the situation. Risk charting combines various risk identification methods by taking into account resources at risk, threats to those resources, asses factors that increase or decrease the risk. (ISO/DIS 2009), (CMU/SEI 2012)

Hallikas et. al (2004) state that risk identification is the fundamental stage of the risk assessment practice. In a successful identification phase the decision-makers become

aware of the factors and phenomena that cause uncertainty. By identifying future uncertainties these scenarios can be managed proactively.

2.2.2. Risk assessment

Prioritization and assessment of risks are needed in order to have the ability to choose suitable managerial actions to tackle identified risk factors (Hallikas et. al 2004). According to Lacey (2011) after the risks are identified, the severity of the potential risks are to be assessed as well as the probability of the occurrence. The quantities of these occurrences will vary between quantities that are easy to measure such investment that fails, and ones that are next to impossible to measure such as effects of negative PR.

Sophisticated risk assessment systems are often made within safety engineering and reliability engineering when it concerns threats to life, environment or machine functioning. In the assessment process it is critical to make the best educated decisions in order to properly prioritize the implementation of the risk management plan. It is worthwhile bearing in mind that many positive features in short-term can have negative outcomes in the long-term. (Lacey 2011)

In the end the demanding part of risk assessment is to determine the rate of occurrence since statistical information is often scarce or hard to base realistic analysis on. Lacey (2011) adds that evaluating the severity of the impact is difficult for intangible assets, therefore risk assessment is often formed by educated opinions based on the best available information for decision making.

Ritchie & Brindley (2000) state that both risk management strategies and supply chain strategies are designed to extract better quality information and improve understanding of the environment throughout the supply chain. Managerial actions towards mitigating the impact and likelihood of these risks are directly related to risk management and control (Hallikas & Lintukangas 2016).

2.2.3. Risk treatments

Ways to treat risks are classified into four categories: Risk avoidance is based on the idea that the company refrains from carrying out a task that holds a risk. On the other hand avoiding a risk also means losing the potential gain that accepting the risk could

allow. (Dorfman 2007) Hallikas et. al (2004) divide risk treatment strategies or actions into five categories: risk transfer, risk taking, risk elimination, risk reduction and further analysis of individual risks.

Risk reduction according to Dorfman (2007) can be seen as as a sort of optimization of risk by reducing the severity of loss or the likelihood of happening. The acknowledge of the fact that risks can be both negative and positive, meaning that optimization is finding a balance between the possible loss of the operation and the possible gain of the activity. An outsourcing procedure with capable suppliers can be seen as risk optimization. The company outsources operation such as software and manufacturing to suppliers, while concentrating on the management of all the business operations and e.g. strategy of the company.

Risk sharing can be defined as sharing the burden of loss and gain, from a risk, and the measures to reduce a risk. Risk sharing operations such as insurances are often seen as risk transfer, when in fact they are not usually, by law, contracts of risk transfer, but in fact rather “post-event compensatory mechanisms”, where in case of the risk occurrence the insurance company is obligated for compensation in favour of the company. It is not risk sharing due to the fact that if the insurance company would go bankrupt, the risk would fall back on the company. (Dorfman 2007)

On the contrary, risk retention according to Dorfman (2007) is about accepting the loss when it occurs from a risk. Self insurance is a part of risk retention. It is used usually with small or/and unusual risks, where they carry a minor impact and a low probability. E.g. a company might not insure their freights since the risk and impact are unusual minor. In that case the company has calculated that the cost of insurances would exceed the potential negative outcome of the risk over time. Hallikas et. al (2004) note that business environments are not static and offer risk monitoring as a way of identifying increasing risk trends in order to have the ability to act accordingly when new risks materialize.

To summarize risk management as a process, a company is to create a risk management plan that is suitable for its use, select appropriate controls or countermeasures to measure each risk. According to ISO/IEC (2013) a risk treatment plan should be done and documented immediately after identifying the risks. The documentation should imply how each of the identified risks should be handled. The

ways of mitigating risks will then be chosen based on the pre-selected security controls. For transparency and future learning purposes, each step is documented from identification to decision-making.

In the turbulent business environment of today understanding risks in purchasing decisions is essential. Therefore a holistic view should be applied when assessing the suppliers and their consequences to supply risks. Due to this supply chain operations as well as supply risk assessment should be seen as a strategic part of doing business since when supply risks are recognized by senior decision-makers the more competent resources can be allocated to track and solve these risks. (Lintukangas et. al 2014)

2.3. Approaches to supply chain risk management and vulnerability

According to Vilko (2012) supply chain risk management has emerged as a critical issue in contemporary business management although its scientific literature is still developing to match its current importance in the theoretical domain. Therefore there is a need to gain information on the topic to develop the understanding of causalities and relations of the phenomenon. It is identified that risks on various levels of the supply chain can be managed by systematically analysing the processes and actors including the cognitive barriers that limits the visibility of the actors and inhibits the understanding for operations including the risks.

The need for the actors to have visibility in order to be able to successfully conduct their supply chain ambitions is underlined. Another stressed factor is collaboration between the parties that can make or break the supply chain performance. Open and sincere collaboration will increase supply chain visibility and increase the odds for success in supply management by obtaining a holistic view. It is suggested that incentives for actors that would motivate them to align their processes in order to improve collaboration and increase supply chain visibility. (Vilko 2012)

A main finding of Vilko (2012) is also the fact that the understanding for interrelations and causalities of supply chain risks is not at the level in the organisations as it should be. If there is insufficient understanding on how e.g. disruptions in manufacturing will affect the value chain performance, there is insufficient understanding also on how important it is to improve in this aspect. Vilko (2012) also acknowledges that trust and

more particularly the lack of it plays an integral part in the shortcomings of the supply chain collaboration. Trust has to be discovered between the parties before successful collaboration can commence.

Wu & Blackhurst (2009) state that modern supply chains are complex entities with simultaneous flows of physical, financial and informational information, that are striving to ensure that right quantities of right goods are delivered in the right time and upon everything cost efficiently. Uninterrupted supply flows are required in order to be successful in the marketplace of today. The supply risk failures are potentially fatal for a company and are to be understood by their severity in order for sufficient resources be allocated to contain the risks. This severity is most felt by SMEs due to the limited resources and lack of sufficient planning in order to counter the supply risks.

One of the primary tasks of risk management is to establish the risk factors that are particularly important for the company. This will enable the company to allocate its resources according to the importance and therefore manage the supply risks in the most effective manner. A total understanding and preparation for supply chain risks is impossible but understanding the sources of risks and being able to prioritize them enables the company to grasp a proactive view in order to reduce and manage these risks. (Wu & Blackhurst 2009)

2.4. Managing supply chain risk and capabilities

Sodhi & Tang (2012) reckons that managing risks is at the core of any manager's business success. What makes supply chain risks even more challenging is the fact that they do not usually lie within the sphere of direct control of the executives. Supply chain risks in fact need a end-to-end coverage of the whole lifecycle of a product starting from product development.

Supply chain risk management is defined as focused on "*supply chain solutions that ensure supply continues to meet demand in case of a disruption or soon after the occurrence of such a disruption.*" What further complicates the identification of supply risks is the fact that an incident can have different impact on a different supply chain entity. The authors find that clear terminology about risk events, risk factors and

consequences is a key factor in order to have a solid base for supply chain risk assessment. (Sodhi & Tang 2012)

A main finding in managing supply chain risks is that focusing on reducing production lead times will help the company's recovery when a risk has materialized. Even though further research on the finding should be applied, this is a reasonable claim and something that can be seen to promote lean manufacturing doctrines. Moreover the findings of the research stresses that the decision makers of the supply chain have to be thoroughly informed about various risks and the effect of these risks. In addition the thesis suggests that the different decision makers should be involved in planning risk management strategies and applying stress tests to gain knowledge on the value chain vulnerabilities. (Sodhi & Tang 2012)

Jayaram et. al (2014) studies Indian family owned small and medium-sized enterprises and their capabilities for successful supply chain management. It is stated that CEO's that are also owners of the company seem to have a tendency for cost conscious behaviour. This tendency thrives for eliminating all waste and prudence in investment and procurement.

On the other hand externally recruited CEO's with no ownership in the company will be less careful with the control of waste and more concerned with the process flow. External CEO's are also more likely to invest in *information systems* and *IT-systems*. In that sense one could see external CEOs as leaning towards developing the company as where owner-CEO's can be seen as a manager that thrives to perfect the current process with lean -styled methods. (Jayaram et. al 2014)

The implementation of information systems and other equivalent IT systems has reduced uncertainty of companies as the systems produce future oriented data based on the company's past and present performance according to Jayaram et. al 2014. Therefore it can be seen that when implementing an information system it can enhance the competitiveness of small and medium-sized businesses and even the gap between large firms and small and medium-sized businesses in this aspect.

2.5. Supply chain risk performance and uncertainty

Zsidisin & Ritchie (2009) state that supply chain risk management is an established although contemporary part of general forms of risk management. In addition having such cross-functional nature, supply chain risk management contributes to most functional areas of business decision making.

International SMEs operating on b2b markets were examined and found that all of the examined companies have organized their supply chain management in the way where they are concentrating on core competencies and have outsourced non-core-competence activities to suppliers mainly from Eastern Europe and Asia. In addition the SMEs have been focusing on factors such as lead times and delivery reliability and have been focusing on the optimization of the supply chain processes. On the other hand the companies examined by Zsidisin & Ritchie (2009) have been primarily focusing on cost efficiency rather than the management of risks and consequences.

It was reckoned that when assessing SME supply risks and consequences, qualitative measures are sufficient in order to gather the essential information for decision making. More crucial for successful supply risk management is the company's ability to understand its supplier portfolio and identify the possible risks and consequences in order allocate resources to mitigate them. A main finding of Zsidisin & Ritchie (2009) is also that in the turbulent global market of today, instead of just minimizing risks, efficient supply risk management can also become a competitive advantage for the company against other companies.

Thun et. al (2011) studied the supply chain risk management in small and medium-sized enterprises and found that in fact *lean* is implemented in the examined companies and considered a norm that every SME complies to for supply chain excellence.

However implementation of lean leaves the supply chain more vulnerable to stock outs and manufacturing flaws. In addition small and medium-sized enterprises often show higher dependency and weaker cash flow and equity position compared to large companies which leads to higher supply chain risks. The solution according to Thun et. al 2011 would be that small and medium-sized companies would engage in the

implementation of preventive risk instruments. Most companies have implemented reactive supply risk instruments such as excess buffer stocks et cetera. However unlike large companies SMEs are often yet to implement preventive supply chain risk instruments such as sanctioned agreements with suppliers for lead times et cetera.

Thun et. Al (2011) points out that full implementation of lean could further enhance the company's preventive implementation of supply risk instruments. Lean encourages to get rid of excess stock and therefore the full implementation would shift the focus of the SMEs from holding excess stock into preventive risk instruments.

The study sheds light to an important factor regarding SMEs implementing theoretic doctrines in the supply chain management. First of all a key observation is the fact that small companies are more dependant to others in the supply chain. As learned the definition of dependency is power and this lack of power over others in the supply chain prevents many SMEs such as the ones in Thun et al's (2011) study from implementing many of the doctrines that large companies perhaps are able to. Moreover basic financial reality of many SMEs restricts their ability to execute the preferred plans. This probably has a lot to do with the fact that instead of following through with e.g. lean implementation they have to settle with having buffer stocks instead of being capable of doing sanctioned agreements as preventive instruments.

2.6. SME supply chain portfolios: firm satisfaction and organization resources

Tokman et al. (2013) studies the supply chain portfolios of small and medium-sized enterprises. The main finding was that supply chain portfolio flexibility is a major determinant on how satisfied small and medium-sized enterprises were with their supply chain portfolio performance. Furthermore firm alliance orientation and entrepreneurial mindset influence the relationship between supply chain flexibility and performance satisfaction significantly.

Due to the relation between supply chain portfolio flexibility and satisfaction, managers are encouraged to set different expectations for different relationships. This meaning that different suppliers have different value for the company and these differences should be acknowledged and acted accordingly. All relationships are not long term the

same ways as partnerships are. Therefore the meaningful relationships should be recognized and given attention to over less important relationships.

This fits well together with the theoretical frame of global sourcing as well as traditional procurement methods. This supports the viewpoint of Kraljic's matrix about there being different levels of suppliers that to whom the company strategy and resources are to be allocated differently. In addition to realizing that different suppliers carry different value to the company, it could be argued that different suppliers have altogether different buyer-supplier dynamics with the company. Factors such as dependency and risk management amongst others come into play when assessing a buyer-supplier relation.

2.7. Collaborative relationships and global SME supply chain performance

Eyaa et al. (2010) explores the small and medium-sized enterprises' supply chain performance. Small and medium-sized enterprises amount to a large portion of the private sector and the study establishes that different dimensions of collaboration have unequal impact on supply chain performance.

When examining the determinants for successful supply chain performance Eyaa et al (2010) suggests that information sharing and incentive alignment were to be significant predictors of supply chain performance. This supports the previous definitions of collaboration where openness and information sharing is considered a key for success. Also a transparent relationship or incentive distribution will enhance the trust in a collaborative relationship. On the other hand according to the study decision synchronization was not considered a significant predictor.

It could be argued that in reality it is often hard to accomplish a transparent, open and information sharing supply chain relationship. This might be due to the fact that high level of openness might disclose vulnerabilities and or business secrets that might cause opportunism among the company's supply chain partners. Distrust amongst other might therefore keep supply chains from reaching their full potential.

Tan et al. (2006) recognizes that global competition has put pressure on small and medium-sized enterprises to further improve their cost and efficiency, provide value adding services and meet the market demand. The study investigated *key motives*, *enablers* and *inhibitors* to give insight into supply chain management issues of small

and medium-sized enterprises.

The recognition of the importance of supply chain management for future success is a key motive. On the other hand the enablers can decide the degree of success e.g. in a partnership. However many positive results have been hindered due to the inhibitors.

Tan et al. (2006) therefore suggests that in order to achieve effective supply chain management it is vital to reach a breakthrough in recognizing the inhibitors. The differences in various business practices and attitudes between the parties inhibits a successful collaboration from occurring. The key is to examine and find the cultural differences and use the knowledge in greater integration between the two parties.

2.8. SME supply chain information sharing

Song et al. (2016) recognizes information sharing as an effective two-way communication going both downstream and upstream the involved organizations having usually been seen as a significant way to solve inefficiencies such as the bullwhip effect or supply chain costs.

However even more importantly the authors claim that information sharing in the supply chain network can ultimately enhance the credit quality of a small and medium-sized enterprise. This would be due to the fact that the increased information would enhance the transparency and predictability, leading to small and medium-sized enterprises leveraging on this by obtaining cheaper financing and creating a more predictable cash flow.

The idea behind this is that through information sharing and transparency in the supply network, the lender would be able to deeply understand the company's business by having access to supply and demand information. This would lead to more trust and understanding between the company and lender which would enable lower interest rates for the borrower.

This could be seen as a yet another viable argument for more information sharing and openness within a supply chain as being valid in the eyes of creditors is essential in today's leverage-based economics.

Surowiec (2015) recognizes that over the past decades supply chain management has been integrated into the organization processes and with other organizational

management functions by businesses worldwide. Due to limited resources and other limitations the small and medium-sized enterprise sector is substantially different.

The study states that scope of information and product flows are decisively smaller for a small business than a large corporation. The typical SME view of supply chain management being dependable on the power of the customers and being a one-direction process. In addition small firms are not as appealing of a partner in a value chain and are often managed at arm's length by larger customers and have to comply if they want to stay in the supply network.

The main barriers for small and medium-sized enterprises in implementing effective supply chain management according to Surowiec (2015) are: fragmented approaches, lack of integration, inter-firm rivalry, difficulties in the measurement and availability of information and inadequate information systems. These difficulties faced by SMEs are mainly a result of the lack of resources.

2.9. Supply chain issues in a SME

According to Kumar et al (2012) globalization and liberalization has made the business environment for a SME difficult since they face increased global competition from large companies. In order to survive in the fierce global competition, SMEs have an coordinated and effective supply chain management to create added value on consistent basis. A well managed and responsive supply chain increases profitability and secures the operations of a company. However resource constraints hinder the implementation of supply chain management methods in SMEs.

A successful implementation of supply chain management can improve productivity, profit and reduce production costs. An important observation is that an successful inventory planning can enhance the liquidity situation of the firm, securing its financial solvency.

However it is important to understand that there is no universal rules for successful supply chain management since each business is unique and is to be evaluated individually. Especially information sharing and coordination mechanisms should be carefully examined before supply chain management systems are implemented. (Kumar et al. 2012)

2.10. Development of a service supply model for a manufacturing SME

Hemilä & Vilko (2015) studies how manufacturing SMEs can increase their effectiveness by deploying and picking up methods from the supply chain of services and implementing some in their own supply management and overall business model. The findings state that SMEs are quick to learn and pick up new ways of developing their business models compared to larger companies. However due to resource scarcity SMEs often need simplified models in order to be able to implement them with success. Overall the study implicates that service sourcing methods can be useful when searching for ways to develop a manufacturing company's supply chain management.

The business scene of today favours operators that can add customer perceived value by adding valuable services to their products. Traditional services would be e.g. after-sales services and logistics. Contemporary ways for SMEs to add revenue and added value of their products would e.g. be offering customers supporting services such as helping in optimizing their processes regarding the sold product. The authors stress that each added service should be thoroughly assessed and aligned with the company's strategy, developed precisely and implemented by carefully testing before the launch. (Hemilä & Vilko 2015)

The whole idea of the service-based viewpoint is to identify and realize the hidden possibilities provided by selling supporting services to the products. This is a thorough strategic operation which can have significant impacts on the current business and business model. This is a useful tool for SMEs to further develop their business models and catch up on the competitive advantages large companies often have over small businesses. Being able to produce supporting services in a supply chain is apt to increase the company's competitive advantage and power within the manufactures. Therefore this is a valuable implication for SMEs operating as a part of a value chain.

3. Empirical part: Case: SME supply risk assessment

The empirical part of this thesis is executed in cooperation with a case company. The research will be conducted by using the Risk Assessment Model introduced by Hallikas (2001). The Risk Assessment Model contains a series of questions related to demand, pricing and delivery reliability, reconstructing a holistic overview of the value chain environment the company is working amidst. The questions are evaluated by the company on a scale of 1-5 by both the probability and consequence, which increases the company's understanding on how probable and on the other hand how grave the consequences of a specific risk would be. The Risk Assessment Model acts as the so called *primary material* (Hirsjärvi et al 1997) of the empirical part and therefore can be seen as the core material of the thesis out of which empirical information emerges for further examination within the thesis.

The research leaves the possibility for the case company to address key topics more freely for more in depth access to the company's experiences of its supply risk assessment. This semi-constructed data collection is therefore applied in order to enhance the informal flow of discourse. Having the possibility to work closely with the case company gives the thesis an exclusive opportunity to extract invaluable information out of a Finnish manufacturing SME operating on a global scale and learn the specifics the company has to take into account when doing business.

3.1. The case company

The case company of the thesis is a small manufacturing company based in Helsinki. The company has been operating for over 70 years and has for the majority of that time concentrated on manufacturing special products for welding industry as well as electric industry. The case company employs circa 5-8 persons out of which 3 are responsible of office operations and the rest are manufacturing the products. The office staff of three comprise of CEO, technical director and a technical manager. Like in

most SMEs, in reality the job descriptions of the office staff are diverse and include most of the aspects of business management from sales to sourcing. The strategy and decisions for supply chain management is conceived and implemented by the staff of three, the highest decision-making-power being held by the CEO.

Currently the company manufactures ovens for industrial welding purposes. These products are sold on a global scale to welding and cutting wholesalers. In other words the case company produces end products in a value chain that caters to end users the world over.

This in one hand means that the case company conducts its sales with b2b procurement managers of the welding and cutting wholesalers and thus needs developed understanding on how contemporary global supply chain management operation functions in order to be able to run its sales strategy successfully. The global coverage of the company's customer markets means that they are exposed to global competition and are under pressure to excel against companies from countries of lower income.

On the other hand the complexity of the case company's products is relatively high meaning that the company purchases most of the components from suppliers out of which many bulk components are purchased from international markets. The company has left the most value adding assembly phase to be manufactured in house. These factors combined make the case company and its value chain an interesting entity to examine from both theoretical and managerial viewpoint.

Due to commercial secrets and confidentiality obligations, the company wishes to remain anonymous and will be referred to as *the case company* in this thesis. In addition the company is not willing to give exact monetary data and or information. However the case company is on the other hand willing to give insightful supply chain information in return, in order to give and benefit from an theoretical viewpoint of its supply chain management.

3.2. Risk management

As a manufacturer of end-products the company has many different tier suppliers varying from suppliers of bulk components to strategic suppliers that matters such as

continuous improvement and R&D is discussed frequently. The strategic suppliers are valuable affiliates that demand time and dedication in order to reach efficiency gains in the value chain beneficial to both the company and the suppliers, as well as eventually the final customers or the consumers of the products.

The case company estimates that the 80/20 -pareto rule mostly applies when considering the amount of attention the strategic suppliers consume compared to the more generic suppliers. The most important suppliers are the ones that provide the most customized products leading to the fact that their supply is the most scarce and therefore valuable to the company. In addition, from time to time, bottlenecks surface from within the generic suppliers, requiring the attention of the management. However these are usually temporary malfunctions of suppliers and do not need continuous care taking and more importantly do not cause serious problems to the case company's manufacturing processes.

Risk management in supply chain management is an everyday occurrence for the company, since they have been implementing and fine tuning the lean philosophy to their manufacturing processes. In this case it means the optimization of the stock levels and aligning purchases with projected sales. This underlines the delivery times of the suppliers as well as the lead time of the in house manufacturing processes. The company has also adapted Just-In-Time -manufacturing elements in order to minimize stock and cut of the excess out of its processes. Being a small company they have to accept that their production and sourcing will not be textbook lean or JIT. However they are committed to improving their processes on a continuous basis, applying as much of the theoretical methods as possible in their environment. The company's JIT system would be closest to the demand-flow manufacturing (DFM), as the company has to pay attention to previous sales in order to successfully project their future sales.

Despite being successful this far in enhancing their production and material flow efficiency through the Japanese production doctrines, the company acknowledges that this contains an increased risk in the company's reliability of delivery. The case company's risk management therefore mostly contains of optimizing the stock levels rather slightly upwards in order to avoid disturbance in the manufacturing process resulting into delays in delivery.

Despite having to compromise in their lean-type-of-sourcing, the case company has been very successful in being able to depend on and even enhance the lead times of their own in-house production. The company has focused on acquiring qualified and capable workforce from the labour markets. Through successful human resources -decisions the company has a manufacturing staff that is being paid better than the Finnish collective labor agreement (TES) requires, but on the other hand has proven to deliver significant added value in terms of effectiveness. Due to their competent workforce, the company is able to continuously assess and make small adjustments to its make-or-buy decisions. The general rule of thumb for the case company is that the low wage and low value adding processes are procured and the high wage as well as the more value adding processes are made in-house. An example of the more generic processes of value addition are many of the metal industry processes. These processes also tend to consume more investments in order for a company to have state of the art manufacturing machinery. On the other hand some of the more value adding, in-house, processes include some of the more complex product assembly, electric engineering as well as some processes of technology industry.

Due to the mentioned reasons the company has not faced concrete drawbacks or interruptions of processes. The suppliers have overall done well with their delivery times and the in-house production has been able to compensate for the shortcomings of suppliers in cases where there has been delays in supply in order to avoid delays in the delivery of the final product. Therefore the company's in-house production offers the company a proverbial buffer for threatening delivery delays, due to the well trained processes and possibility to have overtime hours done on the in-house staff in order to meet the delivery dates. So far this has worked well as a contingency plan and it seems to be effective to a large extent of the more typical risks of the sourced products.

Risk management is recognized as key factor both in short and long term success of the company although in some cases being well prepared alone is not enough and both reacting and improvising is needed. An example of this is a case approximately one year ago when one of the key suppliers for circa 20 years went through a change in their ownership leading into a rapid change in their strategy. This lead unexpectedly and seemingly overnight into a situation where the supplier wanted to terminate all

supplying agreements with the case company and withdraw from the cooperation. On a short notice the management of the case company had to find a replacing supplier with similar quality and costs as the previous supplier.

The case company had a long lasting, though less profound, supplier-buyer relation with another and similar metal industry supplier. After short negotiations the case company and the supplier were able to agree to commence in a deeper cooperation between the two replacing the previous key supplier. This so far has led to a mutually satisfying partnership between the companies.

The case company reckons that the unexpected change in a key partnership had potential to be detrimental to the company had they not been able to find an alternate supplier promptly. In this case the harm caused by the occurrence would have been difficult to measure since the harm would have consisted of supply shortages to the end customers as well as possible quality issues with a new supplier leading into defects perceived by the customers regarding the image of the company products. Therefore there was a potential for long-lasting and steep financial operating losses for the company. This has led the company to even better evaluate and understand the manufacturing processes of their suppliers in order to better share the manufacturing specifics to new suppliers in order to possess the ability for quick changes in their supply base when needed.

This is the way of the company to minimize their supplier risk while protecting the firm from key supplier risks. Normally diversifying the supply base is the ideal situation and is applied with leverage items and non-critical items on the Kraljic Matrix. However diversifying the key supplier base in a small firm such as the case company, is often almost impossible or ineffective since having many suppliers competing for or sharing a small amount of turnover, will often have the suppliers raise their prices and or reduce their interest in a deeper relationship with the buyer.

Therefore the realization of a supplier risk occurs when a key supplier, for one reason or the other, descends from a strategic item supplier to a bottleneck item supplier on the Kraljic Matrix. The mentioned realization of a supplier risk for the case company was a textbook example in practice how supplier risks carry a significant threat to a company.

3.3. Total cost of ownership

As a manufacturer, the case company focuses on counting precise expenses for each product. This means that when assessing the costs of product, the company uses the following method to calculate the profit margin.

First the company takes into account the purchase prices for the parts and components of the sourced items. Then the company counts the lead time of the product through the manufacturing process and calculates the workforce costs by allocating the direct work consumed by the production as well as allocating the lead time with overall wage expenses of the company for the production time in order for all personnel costs to be taken into the consideration for each product. On top of that the company adds costs of the business premises and e.g. tools used allocated according to average revenue which is divided by the average consumption of the product.

The above-mentioned process provides the company with a critical review over its profit margins. By over stressing the staff wages for each product the company is even slightly overly critical since there is over lapse, because the company counts the whole office staffs wages on the production of each product lead time, yet there might be many products manufactured at the same time. The company rationalizes this by the fact that it is better to be slightly over critical when allocating costs and also by the fact that the company operates in market where demand fluctuations add manufacturing costs on a regular basis.

The company operates on a business niche of low competition but high supply and demand fluctuation. Therefore it is vital for the company to have critically assessed profit margins in order to calculate and manage future purchases and other cost drivers to obtain sufficient cash funds at all times. The low competition of the market has granted the company with high direct profit margins for each products. Overall the company is satisfied with their position in the market and ability to have a healthy profit structure to manage and minimize their overall risk of doing business.

In reality the demand for the company's products are depending on the investing cycles of large corporations such as shipyards, manufacturers of various heavy metal industry products and other metal constructions such as nuclear plants and gas pipes.

These companies make large quantity buys in one go. Even though these products are sold the world over, there are always going to be peaks in demand. Therefore total costs of doing business will be higher than assessed costs of production.

The company reckons that there will always be variable costs that will effect business profitability, especially due to the nature of the business they are involved in. However the company wants to minimize all waste in production and is disciplined when it comes to cutting out excess costs due to inefficiency.

The company is extremely keen on preventing any product defects reaching customers. The company believes that worst TCO -based costs would be hidden costs that would be a result of unsatisfied customers that would not repeat their buy in the future. Distrust to the quality of the company's products amongst clients would result in a financial decline. Therefore the case company pays extra attention to testing the function of each product before it is shipped to the customer. This has resulted in almost no consumer complaints of any of the company's products for the last years. In some cases a company with zero consumer complaints would be a sign of over quality and therefore considered excess in production precision.

However in this case the company operates on a market where all of its clients are professional b2b clients that themselves operate on highly regulated fields of business. Therefore defects in these products might cause damages of significant monetary value. Many of the case company's products are used on shipyards and e.g. in a case where a shipyard would notice a defect in the product after they already have welded the whole of a ship's prow would be a major setback for the shipyard as well as the case company. Therefore, in fright of seriously damaging its customers' business and as a result its own, the case company will continue to stress the quality of their products also in the future.

The case company estimates that the uncompromising quality is in addition an competitive advantage for them. They have noticed various competitors enter the market niche over the years and most of them have for some reason exited the market after some time. The company believe that this is due to the fact that new competitors often compete with price and therefore use lightweight components or otherwise sub-par materials which might over time expose defects when put into heavy use. This

loss of perceived quality amongst customers might be the reason for the disappearance of many of the previous competitors.

Overall the case company has been able to minimize its costs of after sales and consumer complaints which would directly cause re-shipping costs as well as repairing or extra manufacturing costs for having to replace defect products with new ones. However, probably more importantly, the case company has been able to avoid the more grave indirect costs that would materialize in losses in company image and overall customer base.

It is also worthwhile noticing that unlike perhaps the most manufacturing companies the case company does not spend significant amounts to investments. This is due to the fact that it has outsourced the machinery-consuming metal industry manufacturing and has concentrated in assembly and electronic parts which do not require large investments due to the special product niche of the company's products which in this case means that much of the assembly is handmade with regular tools. Therefore all the special capability requiring work is kept in-house, while all the generic metal industry production is outsourced. However the ability to produce small quantities of metal components is kept in-house to prepare for possible delivery problems of suppliers.

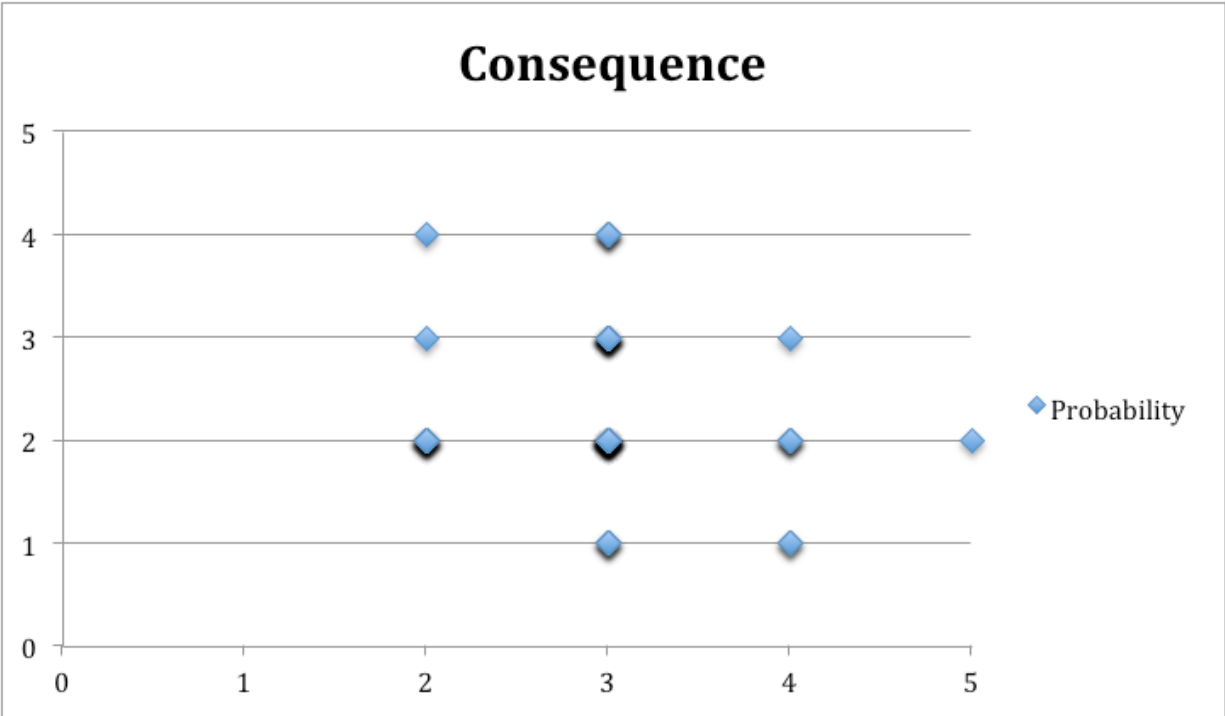
3.4. Risk assessment of the company

The following chapter will concentrate on assessing risks related to the case company's supply chain. The risk assessment is conducted by the "Risk Assessment model" introduced by Hallikas (2001). The goal of the assessment is to clarify the risk consequences and probabilities problems in demand, pricing and delivery criteria. The risk assessment was conducted as a questionnaire which can be found in appendices under "The Risk Assessment Model."

The Risk Assessment Model consists of questions of different various supply risk dimensions including demand related problems, problems related to cost control or pricing and problems meeting delivery criteria. These questions are evaluated on a scale of 1-5, by the probability of the occurrence and the consequence of the occurrence. 2nd Table portrays the results of The Risk Assessment Model applied for

the case company. The weighted dots describe that most of the companies risks analysed in the Risk Assessment Model are perceived as moderate in the sense of both consequence and probability. In addition as the table showcases, the risks that have high probability do not usually have grave consequences and vice versa. The following sub chapters will examine the results of the Risk Assessment Model qualitatively in attempts to find a holistic picture of the case company’s supply risk environment in order to reach accurate conclusions on the research questions as well as give managerial implications on the topic.

2. TABLE (results of the risk assessment model)



3.4.1. Consequences and probabilities

The risk assessment model contains six generic questions regarding the business environment of the company.

The case company estimates the probability for a client to reduce its suppliers as something that could happen from time to time considering the characteristics of a

modern business environment. This would have an impact on the company in the short term as it would have to use resources to find alternate sales channels for its products. This would further create fluctuations in sales and possibly create short term problems in cash flow and inventory.

Also a case where a client's focus would shift from current business core competence to something new could happen from time to time. The consequences for this are potentially grave if a major client would shift its business to a new sector or niche. This, in a large scale, could change the market niche profoundly and possibly end it as it is. The case company gets this kind of signal from large clients from time to time, however this far it seems to be more of a sourcing game theory maneuver from the case company's clients, trying to obtain more negotiation power according to the case company. Although these kinds of signs incite the case company to minimize its inventory to confine its risks if there in fact would be some groundbreaking transformations in the market. This in fact initially encouraged the case company to adapt lean manufacturing methods in the company.

The probability for a client to find a more competitive supplier is fairly unlikely. However if this would happen the case company recognizes that the consequences would be severe. This would force the case company to lower its prices to the same level as the competitor in order to stay competitive and face the distinctive demand fluctuations of the market niche in a fierce competition of survival with the new competitor. The company has faced competition over the past years with new operators entering the market with considerably lower prices. According to the case company's own research and benchmarking, these companies have concentrated on price instead of quality. However some of these competitors have been able to obtain market shares briefly with their low pricing, but have since exited the market probably due to unsatisfactory quality of their products or due to demand fluctuations having an effect on their finances due to a thinner profit structure.

The case company operates on a global scale as their products are used in all parts of the world. However from time to time their degree of internationalisation is questioned due to the small size of the company. There has not yet been negative impacts for the company for lack of internationalisation as the company has a long history of doing international business as a SME.

The last question of the first chapter in The Risk Assessment Model is about how creation of larger deliveries would effect the company. As the company is used to demand fluctuations this is not a novelty for them. In fact a more severe problem for the case company is how to collect the receivable of a large delivery. According to the case company especially large multinational companies have the habit of buying large quantities at one go and pay their invoices late. However due to the nature of the niche market, delivery times for large orders can be longer and it is not unusual for large deliveries to be sent in many smaller parts. This gives the case company leeway to plan its production and delivery beneficial for itself. The company tends to ship a large part of the delivery as early as possible and leave a smaller delivery as a backorder. This backorder shipment is to be sent after the due date of the invoice of the first shipment to ensure that large part of the delivery is paid in time.

3.4.2. Demand-related problems or small number of orders

The demand-related problems or small number of orders chapter of the risk assessment model starts with background questions examining the circumstances the case company is operating in with its clients. First the company identifies having 3 major clients out of one is the most important one: the world's most prominent seller of welding and cutting equipment. In addition as a answer to one of the background questions, the company assess that it has core competences outside the line of current line of business and clients. The company also rates itself as being competent in marketing and customer acquisition.

Demand from the customers of a major client decreases

The risk assessment model then concentrates on what effects declining or abruptly ceasing demand would have. The company is accustomed to demand fluctuations and considers it a characteristic of the market niche they are involved in. Therefore the probability for abrupt changes in demand is high. These fluctuations also influence the business profitability in the short term. However the case company's pursuit for lean manufacturing confines the company's risk in these situations since it minimizes the company's inventory, therefore maximizing the company's liquidity.

Problems related to a major client's product sales

In case of the case company's clients, the welding and cutting equipment sellers, would have their competitiveness diminished, it would have an effect on the company's business until it could be able to find new sellers. The company estimates that it would be more likely that the general industry would face changes that would have negative effects on the company. In other words since the markets are fairly established the case company estimates that it is more likely that major changes would happen on a business field level than on a company level.

The risk assessment introduces a scenario where a client's new product model would fail or its market entry would fail. This could theoretically decrease the case company's sales if there would be large amount of sales withdrawn as a result of the failure in launching the new product. However since the case company produces complete end-products and not components to other products, there is no direct causality to demand in the mentioned situation. Although it has to be stressed that there is a causality between the demand of generic welding products and the case company's special products which are often sold together in sales of large quantities.

A situation where the end client would not trust the case company's clients, the welding and cutting sellers, network capacity, is unlikely to happen. This is due to the fact that the case company sells its products via known international sellers specialized to the industry. However in situations where the end client would have a disagreement of some sorts with the case company's client, it could result in losses also for the case company in the short term, since this would perhaps accumulate excess inventory as a result of cancelled purchase orders.

The position of the company as part of the client's supplier network weakens

The case company estimates that mergers and ownership changes happening in the supply chain occur seldomly but when they do they carry short term risks for the case company. In other words when the risks realize it makes the company vulnerable for the time that it takes for it to find a new supplier. As mentioned in the risk management chapter, this happened to the case company for approximately one year ago and created distress and uncertainty but first and foremost acquired management

resources for the company to secure a new partnership with a metal manufacturing supplier. In this case having comprehensive relationship networks on the metal processing sector helped to solve the problem fairly quickly. If this had not been the case, the problem could have been more grave and long lasting.

In the case where a client would decrease the number of its suppliers leading into the case company being dropped as a supplier, would have major impact in the short term until the company would find substitute sales channels. A more probable scenario than this would be a case where a client would shift its strategic focus towards a different kind of revenue logic. The company also estimates that the possibility is low for a situation where a client would require a change in technology or volume that the company would be unable to meet however this would also have a short term impact for the profitability of the company.

In a case where the case company loses a client's trust due to insufficient delivery reliability, is also assessed as unlikely by the case company. The company has emphasised delivery reliability in their production and they have been able to keep it on a high level. However in case they would face problems regarding this, it would have an impact on the business in the short term. The loss of trust would materialize as cancelled purchase orders and diminished sales.

A more significant issue in terms of trust would be in regards of quality. The case company estimates that issues related to trust could even have detrimental effects on the company's business as their business logic is based on delivering superior quality compared to other operators. Problems in quality would damage the company's customers perceived value and would have a long lasting impact on the case company's revenue and profitability. However the company has developed production systems that have enabled them to minimize the defects of their production. As they are a manufacturer in a niche market, producing special industrial products, being able to minimize defects is vital in order to earn a reputation as a high-class operator in the market.

Another scenario in the risk assessment model is the possibility of the company disclosing confidential information. This is estimated to be unlikely due to the fact that the amount of staff that would have access to confidential information is limited and they are aware of their responsibility. In addition the market is fairly established and

therefore clients are often well aware of their needs regarding the case company's products and do not need to share much of confidential information in order to be able to buy the needed products. However if this sort of leak would occur it would potentially have long lasting and grave effects on their business as their integrity would be questioned.

A situation where the client chooses a more competitive supplier from outside of the established supplier network e.g. a large corporation expanding to the case company's market, is regarded somewhat unlikely by the case company, however if happening it could impose a real threat or a competitive situation. For this scenario to realize, it would take a large company with a strong economy and willingness to endure losses for the first years of operation in the market in order to sustain competitive quality from early on, gradually improving its efficiency to become profitable. This would possibly result in a pricing feud between the two parties since the market niche is small and probably not large enough to satisfy both companies as market leaders. As mentioned before this has not been the case over the past years as the competitors have failed to produce adequate quality probably in hopes of capturing the market with low pricing and par quality.

The risk assessment model then creates a situation where the position of the company in the client's network deteriorates due to lack of resources for internationalisation required by the client. This can be considered as an somewhat unlikely occurrence since the case company has been involved in international trade for over half a century. Nevertheless this sort of a situation should never be overlooked and the company has to strive to keep all aspects of their operations fit for international competition.

Next in line in the risk assessment model is an occurrence where the case company expands to the international market with the client, but the demand does not meet the expectation. This situation is not logical to the case company since it has already established itself on the international market of its niche products, therefore this situation will not happen as mentioned, however fairly strong demand fluctuations are a norm on the market therefore the impact level can be identified as something that will have an effect on profitability on the short term.

Issues related to production experienced by other suppliers in the network affect the company's volume

The last question in the chapter of demand-related problems or small number of orders is how would delivery or capacity problems affect the case company's volume of orders. The likeliness for this to happen is fairly low due to the high delivery reliability track record of the case company as well being accustomed to demand fluctuations. There would probably be apparent short term impacts on profitability as the sales would decrease due to possible cancellations of purchase orders.

3.4.3. Problems related to cost control or pricing

The risk assessment model sets the following chapter up starting with background questions, according to which the case company is familiar with the cost structure of its clients' end products. Also the background questions shed light to the fact that operating in its networks has not significantly changed its product pricing nor the price levels. In addition open pricing models are not in use in these networks nor has the operation resulted in changing cost calculation methods or cooperative attempts to decrease costs.

Problems in the calculation or control of production costs

The first questions of the chapter is what kind of effects would inaccurate cost accounting have on the company. This occurrence is regarded as fairly unlikely since the company has well established cost accounting methods as well as an established product range with standardized manufacturing processes. However in case these would become an issue, the consequences would be visible in the short run as the company would have to possibly adjust its prices as well as suffer the losses among other effects of undesirable pricing.

The likelihood for that the case company will suffer from rising raw material and component costs is very possible in gross amount, but due to the fact that the company sources its components from international markets, it is fairly safe from losing its competitive advantage to international competitors. In other words the company is

not afraid of nominal prices rising due to inflation, they are concerned that regional prices e.g. in northern Europe would rise and have therefore taken steps to seek best prices for their components on international markets. E.g. most inexpensive electric cables are bought from factories in Turkey and Slovakia. Most inexpensive electric contactors are at the moment sourced from wholesaler in Spain, saving almost 50% compared to the exact same products in the Scandinavian markets.

The likelihood for the case company to not receive a price benefit for acquisitions as the main acquirer, is low due to stark division between mundane suppliers that are easy to switch seeking the best price and few strategic suppliers that the case company is deeply cooperating with. Therefore unpleasant surprises in prices seldom occur. In this case they would although have some effect on profitability but not of major importance.

However the situation is more grave with the strategic suppliers whose efficient metal production the case company mostly depend on. Theoretically if some of these suppliers would want to exploit these partnerships for a short term gain, it would have significant effects on the case company's business profitability. Nonetheless in reality Finland and the Baltic states have a fairly large and diverse metal industry, making it possible to switch even special product suppliers fairly quickly. Also the price level in metal industry subcontracting are fairly competitive due to e.g. shipbuilding industry and mechanical industry.

Labour costs often play a large role in a company's profitability. For the case company this is also the case. The case company is generous in rewarding efficient workers and have been successfully able to hand pick outstanding employees from the labour market. The workers are paid significantly better than the collective labor agreement (TES) suggests. Therefore the company estimates that it would be able to stall a little while the increase of the wages of their workforce in case the general labour costs would start to rise in Finland. In addition once again the company underlines the real labour cost increases compared to nominal increases, since the competitive edge of the company is attached to the comparing numbers around the world. E.g. in addition to trade restrictions towards Russia, the decline of Russian industry, which uses the case company's products, has meant leaner times for the case company. By this example the case company wants to underline the complexity of changes in the global

business environment - theoretically the case company's Russian clients are now forced to seek cheaper alternatives due to the decline of the Russian ruble.

The Risk Assessment Model is curious about situations where the company's expenses do not correlate with the demand fluctuations. As mentioned numerous times in this thesis the company operates in a niche market where demand fluctuations go hand in hand with investments of large corporations and other large-scale investments e.g. in infrastructure et cetera. This means that the market niche has developed into a high profit market according to theoretical cost accounting. The demand fluctuations play a significant part in the company's profitability by the end of the fiscal year. However the company has grown to manage the fluctuations of working capital by implementing a lean -inspired manufacturing system.

This applies also with the risk assessment models inquiry on low predictability that creates extra expenses. As this is a standard rule of the market niche, the case company has learned to handle this and tries to exploit this to the extent where it would be a source of protection from new competitors.

The likelihood that the case company's production equipment would become outdated and inefficient is fairly low due to the fact that the company has outsourced the low cost and high investment production processes to metal industry subcontractors. The assembly of the products are done by the case company and they contain the amount of specialisation to presume that the probability for losing their competitive advantage is all things considered low.

Larger responsibility and more extensive products set additional requirements to the company operations, causing expenses to rise

Due to demand fluctuations the probability for changes and restraints in working capital are the norm for the case company. It does not matter if the root cause is an increase in overall business volume or just periodic fluctuations, since both are tackled with same means however the latter causes more potential issues in the management of inventory and puts the company's lean mentality to test. The fact that these issues surface periodically means that the case company is well aware of them and have created coping mechanisms, e.g. methods of lean, in order to manage their business.

Therefore the consequence for restraints in working capital cannot be regarded to have more than short term impact in the case company's profitability.

As mentioned with the rapid fluctuations of demand, the issues of working capital manifest in the inventory levels. The company produces special products with fairly steep demand fluctuations between the different products. Therefore it is in the interest of the company to minimize its stock to maximize its cash position in order to secure the company's liquidity. The risk assessment model paints a situation where the clients would be able to shift their inventory to the case company. This probably is an universal struggle between sellers and buyers and the situation of the case company is no different. This game of who will hold the majority of the inventory is ever apparent according to the case company. However due to the unique product range and market niche, the case company has been able to impose its will on its clients in terms of delivery times and payment conditions.

The fact that the case company is a small SME and its clients are global corporations this means that the negotiation situation is somewhat turned upside-down. This has not gone unnoticed in the organisations of the clients and there is an apparent discontent within the largest client of the case company. The large client would want to impose short delivery times to shift the inventory to the case company. In addition the large client would want to have 90 days payment terms time instead of the current 30 days. The case company is naturally not content with this and therefore have not agreed with the terms. The large client has responded by threats to substitute to other suppliers. The case company has not given in since they are convinced there is no valid substitutes to their products.

Since they have not been able to do the substitution, the large client has reacted by not paying for their purchases on time and trying to force the 90 day payment conditions by simply paying after ninety days. The use of international debt collector agencies has helped the case company's problem but the threat on liquidity still remains as the large client often buys larger quantities at once and tries to pay the invoices late. The case company has responded by delivering most of the goods early while leaving some of important deliveries past the due date of the first invoice in order to have leverage by being able to not send the second delivery if the initial payment is not been fulfilled.

The situation has led to a feud of sorts which will not be good for business in the long haul. The tit for tat game has led into growing distrust and cynicism between the two parties including opportunistic behaviour on the expense of the counterpart. Even though not being completely causal, an incisive sign of the level the conflict is the fact that the large client has sacked or removed multiple supply chain managers that have been responsible for the case company's segment, over the past few years. According to the case company the problems started approximately 5 years ago when then the client was purchased by a new owner which then started to enforce new methods such as mentioned, with their suppliers.

Investment costs increase

The following questions regard the case company's investments and its effects on the business. The first question is how expansion investments would affect the company's debt-equity ratio. The probability for this is not high since the company operates on a well established market where the growth rate of the market is based on the global investment rate of heavy metal industries. The fact that the case company stands alone in the high end products of its market niche, there is no expansion investment seen in the horizon. Therefore the probability for it is fairly low. On the other hand the company's balance sheet is solid and an moderate increase in debt would not be an obstacle for the company's operation.

In addition a situation where the proportion of the company's investments would become too large compared to the resources of the company is fairly unlikely. The company has not much room to grow in their market niche therefore there probably will not be large scale investments in growth in the near future. On the other hand the company has been successful in sourcing the activities in their value chain that have low addition of value and large quantity of investments, meaning the metal processing. Therefore at the moment the company is fairly safe from large scale investments.

Also investments regarding internationalisation are unlikely. The case company will probably be able to find substitutive clients if the current sales partners fail or fall out with the case company. An investment in a global sales force would be a challenging mission for a small company and time has shown that the case company is well situated when positioned as a manufacturer, leaving the sales operations to the large

companies with the need for complementing products in their product range and the sales force already in place to do this. The fact remains that the products of the company are delivered for demanding sites of construction and manufacturing all over the world and a cost effective way of doing this is to use global wholesalers with a comprehensive sales network.

The threat of the cycle of investment being increased is also somewhat unlikely since the high investment grade operations are outsourced to metal manufacturers of which there still are plenty of in Finland and the Baltics. A radical shock for the metal industry in the Northeastern Europe however could have a grave impact on the company's performance, but this, on a macro scale, seems too unlikely to be taken into account regarding the purpose of the survey. Therefore probability and consequence are both low for the occurrence.

In case there would be made a wrong investment the company sees the situation as of minor importance due to the low investment grade of the company. Although on a more wide perspective a bad investment on personnel could have long lasting effects on the company's performance. The company has in fact been extra cautious over the years in hiring, due to the employee protecting labour laws as well as the sheer cost of a new recruiting process.

On the other hand these investments in expertise and special manufacturing are focused on a narrow field. This is a potential risk that can realize if the demand of the current products would decrease permanently. However on the other hand the means of production in the company also have the ability to produce more general products since that would be a step to less complex manufacturing to the company.

In case an investment would prove erroneous or e.g. the launch of a client specific new product would fail, the effects would be tolerable. The company is in a constant process of finding ways to remove the excess from production and finding new ways to improve customer perceived value on the products as part of the lean philosophy adapted by the case company. Therefore there has been cases over the years where new spin off products have not been as successful as wanted. The case company mentions the building of the Oresund Bridge between Copenhagen and Malmö where the customer wanted a special product for demanding construction conditions. Ever since the sales to the mentioned project were done the sales for the product have been scarce and

irregular. On other hand the company reckons that continuous R&D on a healthy scale is valuable in the renewing of the products and misses in products cannot be avoided in the long run. The main aspect is therefore to keep the investments in accordance with the company's overall financial situation and prepare possible new product launches carefully.

The probability for the company to be pressured into making larger investments is low in probability and consequence as such. However there has been attempts to pressure the company into keeping larger inventory by some of its large clients. This has manifested in demands to decrease delivery times as well as accepting longer payment conditions. This rapid increase in inventory would deteriorate the company's cash position and make it more vulnerable for demand fluctuations. Although this is unlikely to happen at this moment due to the case company's current position on the market as well as its negotiation power in regards to its clients. However this explicit display of strength under pressure might be retaliated by the clients if the case company's market position would deteriorate in the future.

The price or availability of money causes problems for the company

A situation where the interest level for the company by the lenders would rapidly increase, would have at least short term consequences for the case company's profitability. However the company could endure such a situation fairly well since its debt-equity ratio is strong, its debt is low also nominally and the case company has the ability to seek own equity based financing. Altogether rapid increase in interest levels would in fact have short term impact on the operations of the company. In order to not having to pay high interest rates to lenders, the company's resources would be consumed by the arrangement of its financing structure to reflect the desired balance. These resources would be taken out of e.g. product development and would on a short term halt or hinder the full implementation of the company's strategy. Other than that and even more explicitly the increased interest rates would erode the company's net profit.

A very current topic when discussing international trade is the issue of exchange rate fluctuations. The case company does almost all of its business in euros with its clients. Therefore this has not been a direct issue for the company. However even though the

case company has been able to avoid these issues, some other party will carry these risks considering the fact that these products are sold the world over. As an example the case company estimates that the downfall of the Russian ruble in simultaneous effect of the trade restrictions has caused a decline on the Russian market where heavy metal industry such as gaspipe construction, shipbuilding and the construction and maintenance of oil refineries are still a stark economical force. The fact that buying the case company's products have become increasingly expensive is therefore an indirect result of exchange rate fluctuations that realizes as loss of potential sales.

The risk assessment model also addresses a situation where financing would be a significant bottleneck for the company and would restrain the company's development and expansion. This is estimated to be fairly unlikely by the company. The estimate is based on the fact that the company has a strong balance sheet, including low debt-equity ratio meaning that both banks and own equity based investors should feel fairly safe with their money. However since as result of the financial euro-crisis many banks have tightened their lending for SMEs, or the SMEs face more austerity when applying for borrowed money from banks. The reality probably is that SMEs in financial hardship are now more unlikely to receive bank financing, however the case company has not faced this problems due to strong own equity.

Product pricing causes problems

The next chapter of the risk assessment model focuses on issues related pricing. The first issue is about if the pricing of the case company would fail. This is an interesting topic according to the case company since the current situation on the market is established as a quality producer. This is verified by the fact that the product prices of the case company are significantly higher than the competing products. On the transparent market economy of today, there would not be a market for products that are significantly more expensive than its competitors. However the question of pricing is an important matter since as of now the company operates with high gross margins, which to some extent erodes the sales of the company. However due to the demand fluctuations, high gross profits protects the company and its liquidity and can be seen as a competitive edge compared to other competitors. Everything considered the case company is content with its current pricing as it cashes in on its reputation on the

market as well as protects the company's financial position. In a case where a worthy competitor in the product high segment would appear the company has the possibility to squeeze its margins and start a competition with prices in order to survive the competition.

The next question in the risk assessment model is about a possible price competition and how it would potentially have an effect on the market position and profitability of the company. As the company is constantly evaluating the level of competition and staying out of unnecessary pricing competitions with competitor, the company has to take into account a situation where a well financed operator would enter the market not compromising on quality and squeezing margins thin. In this situation the case company would be forced to engage into a price war immediately and rely on its track record and well established name on the market. The case company also acknowledges that in a small market niche such as the one they are operating on there is no room for many operators. Especially the high quality segment in the niche is only satisfying for one company at a time, therefore the battle for pricing would be ruthless in the sense that perhaps only one company will survive the altercation.

The next issue brought up by the risk assessment model is about a situation where the client would have power or control over the case company's product price. To the discontent of the case company's clients, the wholesalers, the case company has not lowered product prices allowing the wholesaler capture a larger margin on the products sold. The largest client even went on to raise the list prices of the case company's products in order to provoke a reaction from the case company and possibly even to muscle them to lower pricing in fright of losing sales. The case company however calculated that most of these special products are sold directly from the wholesalers to end user possibly as a part of large scale contracts. Therefore the list prices are only nominal prices as the large bulk of sales are brokered between the wholesaler and end users, such as shipyards and oil refining companies, which can negotiate down the prices by bidding between various wholesalers. Without receiving a reaction the wholesaler has since lowered the list price down to what it was before.

An issue also introduced by the risk assessment model is the situation of prolonged declining of the product prices. In other words this would be a situation where there would be a serious price war between two quality operators on the market. The case

company estimates that on the long term two operators would not be content in sharing the segment since it is such a small niche. Therefore it is probable that a bitter price competition would ensue. Due to the financial situation and position in the market the company estimates that it would have an upper hand against a competitor but understands that a prolonged competition would not do favours for either of the competing parties and that one would have to go.

Unrealistic price reduction demands as well as overall demands from time to time occur from the clients however they usually can be negotiated and rationalized with the clients in this case the end users. The case company does not broker prices with clients on individual sales and therefore time is not consumed that much on negotiating individual deliveries. However the case company would be interested in giving discounts on annual quota orders by clients. However until now the demands for minimum annual quantities have been too high for many of the wholesalers.

The situation where the case company would be unaware of the additional value for the client is somewhat unlikely however possible as clients can often be resourceful when utilizing products in their own production. A case where the case company would lose money for not capitalizing on a hidden value adding function on their products is although unlikely. The price of the case company's products and the level of specialization are both high and therefore almost any normal purposes the product could contain is of lower value addition than the current purpose. Also in more general terms a case where the case company would be under pricing its products is also low in probability. The products are by all counts high in quality compared to the market competitors but also clearly the most expensive ones. Therefore the case company estimates that there is next to none pressure to price the products higher as the difference to the competition is already close to staggering in terms of the case company's product prices.

3.4.4. Problems meeting delivery criteria (delivery times or quality)

The chapter of the risk assessment model discusses issues companies face with meeting the delivery criteria in terms of shipping dates and quality. The risk assessment model sets up the chapter with background questions that are meant to

delineate the outlines of which the company operates within. The company estimates that over 70 per cent of the information flow of the company's order-delivery process is communicated electronically. In addition the delivery times of goods purchased by the company compare to delivery times of products made by the company are roughly equal. Strategic cooperation with its clients is estimated as moderate with its clients and high with the important supplier. On behalf of all suppliers overall, the level of cooperation would be moderate. The case company estimates the level for the number of replacement subcontractors for the company as moderate, meaning that the company has access to substituting strategic suppliers when called upon, however it will consume resource to negotiate and share the product specific information and other insight information. In regards to generic suppliers the case company estimates to have a good position in terms of having many substitutive suppliers on the market. According to the case company the cooperation regarding the product life cycle is primarily carried at an early stage.

Internal processes of the company

The company estimates that the probability for deliveries being delayed due to defaults in product planning is low due to the track record of the company. The company very seldomly has had delays in their production due to the established nature of its production, established and professional employees and the company's ability to make up for time lost due to delays of suppliers by conducting its own employees to work over time. This is also an aspect the company has emphasized over the last half a decade or so as they have started to apply lean methods and philosophy in their production. Predictable and reliable flow of production also ensures the case company's cash position as the company can minimize its inventory. Bearing in mind the problems with the largest client, that is not willing to pay invoices as agreed, production reliability is a key factor since the company has to plan its shipping dates accurately to realize its receivables, by shipping the large bulk of the delivery quickly and the rest of the delivery when the first delivery is paid. Therefore the consequences for having problems with production planning and meeting delivery expectations would potentially cause short term problems for the company.

The probability for that the case company's ability to manage projects would be insufficient for large-scale deliveries and requires acquiring extensive amount of technology is estimated as low by the case company. The reasoning for this is the fact that the products and therefore the technology is well established. This is due the fact that the case company owns the rights to its own product range and has established itself on the market. On the other hand having sufficient funds to fulfill larger deliveries is something the case company has had to get used to over the years as the market niche is high in demand fluctuations and driven by large infrastructure, construction and other investments around the world. The company is a market leader in quality and product technology, therefore the consequence for if the company could not respond to client driven request for higher technology would be low as the chances that they would lose the client to a competitor is low. However over the years the best development suggestions for products has come directly from the clients and therefore all suggestions should be dealt with seriousness.

The probability, for errors and usability of the company's ERP system would negatively impact the meeting of delivery requirements, is low. This due to the fact that the company's order book practices as well as products and production are well established and rehearsed. On the other hand if the situation despite its low chance for occurrence would happen it would have the possibility for causing significant short term harm as the case company should reorganise and figure out what to do and in what order. These sorts of mixups are prone to cause dissatisfaction amongst clients as deliveries are delayed and even more substantial harm for the company's reputation if deliveries are mixed up.

The probability for insufficient stock to prevent the fulfilment of delivery in time is fairly low due to the fine tuned lean -styled manufacturing philosophy adapted by the case company. From time to time the company comes under pressure and its pipeline is tested when a supplier fails on meeting its delivery time. However the company's manufacturing is often able to compensate for the shortcomings of the suppliers. In addition the special product niche market the case company is operating in is used to buying products that have longer delivery times than perhaps many other industries especially compared to the B2C markets. On the other hand being delayed on the agreed delivery dates is never an ideal situation and can cause significant harm to the

client. This will result in potential loss of sales for the delayed delivery and potentially loss of the client for good. This in addition, due to production and cash management reasons, is an important reason why the company puts such an emphasis and investment on the efficiency of the in house production.

The next supposed occurrence to assess according to the risk assessment model is as follows: Long-term machinery or staff capacity is insufficient to meet increased demand. The probability for this to occur is very possible but for it to cause long lasting harm is unlikely. This means that the company evaluate the hiring of competent and loyal employees that respond well to challenges and understand the higher requirements that come with the higher pay. Therefore in a case where there would be a permanent significant increase in demand and the case company would have to hire new personnel, it can be seen as more complex operation than an average recruitment campaign. The case company would pay extra attention to gather word of mouth from its employees as well as people they know to find a person or persons with the desired attributes and more importantly the motivation needed. This means that when this supposed problem would occur it would have short term impacts on the production and profitability of the company, however it is hard see that this would be a long lasting problem, rather something that consumes resources and the attention of the management for some time. On the other hand machinery and tools are easy for the case company to acquire since they do not consume significant investments and can be purchased on a fairly short notice.

The odds for a scenario where the case company is facing recurring unexpected problems and interruptions in production resulting from long setup times or new product models is relatively low. This is due to the fact that the case company has an established product range and is operating on an established market niche where the products contain an established purpose. However the case company is constantly trying to improve its products and therefore minor enhancements are made from time to time. This however gives the case company the privilege to focus on just the new add ons instead of having to engineer completely new products or functions. This leaves time for the company to thoroughly test the enhancements before they are put up for sale, lowering the possibility for errors and defects significantly. However when realizing, these sorts of problems would have significant consequences on the short

term as the case company would fail to deliver the new product in time, leading into a failure of a product launch.

In a case where the company would have insufficient production equipment service reliability and performance there could be various significant consequences that would affect the sales and the overall image of the company. However the probability for this is quite low since the company has strategically outsourced the metal production that is high in investment grade and lower on added value. This means that the company does not have to do heavy investments and can focus its in house production on the more value adding assembly of metal components and electronic components. Therefore in case the company's suppliers could not compete with prices due to their production equipment being insufficient, the case company would have to find substitutive suppliers. This would consume time from the management but this would probably only cause short term problems for the company. This is reasonable to expect since according to the company the metal industry sector is strong in Northeastern Europe meaning Finland and the Baltic states such as Estonia and Latvia.

A situation where the case company's productions delivery cycle is too long or its predictability varies greatly, is apt to cause loss of sales in some cases. Therefore if this would be the case with the case company the chronic unpredictability would decrease the company's revenue. How much that would be, cannot be explicitly measured. However perhaps an even more explicit problem for the company would be the inability to follow the principles of lean as they would not be able to estimate production lead times and plan production and purchases accordingly to execute the lean philosophy. However due to the methodical and disciplined production of the company, the situation for this can be estimated as highly unlikely. On the other hand the company acknowledges that in order to sustain the well performing in house production they have to continue putting emphasis on it in order not to lose this competitive advantage they have striven for.

Another valid risk to take into account would be according to The Risk Assessment Model too wide of a product range that makes production process difficult to control. This is a very possible problem for any company that is committed to serving its customer base as well as they can. The hidden problem is that different customers have different special needs for products out of which some are useful for a whole

segment of customers as others are only servicing the need of very few customers. Against this assumption it is therefore easy to see the possibility where a company would try to maximize its revenue by catering all needs that various customers communicate to them. The case company avoids this sort of a risk by not only carefully assessing its new enhancements on its products but also by not expanding its product assortment without a heavy reason such as a case where the industry would need a completely new product due to radical changes in the market. The basic idea is therefore to develop the current products with new generation facelifts when necessary. With this philosophy the case company sees the occurrence for this risk as unlikely. Although when realized this would cause problems in the short term as the company would have to get rid of the unprofitable products and realign their production with the remaining products resulting into spoilage on regarding the components of the defunct products.

A scenario where the company experiences problems in meeting the client's quality criteria is unlikely due to the emphasis that the case company has put on producing high quality. With its current production system as well as habitual testing to all products that are shipped lowers the possibility for producing unsatisfactory quality significantly. However being unlikely, the effects of producing, unsatisfactory quality has potentially catastrophic consequences for the company. The company has established a stellar reputation on the market as a provider of quality in its product segments. As a result the products have been sold to the more challenging projects of the industry around the world. On the other hand this has allowed the case company to keep significantly higher prices compared to the competitors on the market. Therefore if the risk of deterioration of the customer perceived quality would realize, it could potentially force to change the whole business segment logic for the company. The case company would then probably have to lower its prices while keeping the high quality in order to regain the lost customers and reputation. In any case this would be a slow process with significant impact on the company's profitability.

Raw material in the stock being useless or otherwise inappropriate for the end products is a scenario from the risk assessment model that is improbable to happen but would have significant impact on a short term if it would concern the whole of or a significant part of the stock. The reason it is estimated unlikely according to the case

company is due to the fact that the product range of the company is established and therefore they mostly carry only components that are used as standard in their products. In addition the inventory of the company consists of products and components that do not decay in normal storing conditions. Also in retrospect the company does not recall situations where inventory would have decayed beyond the point where it would be not usable for production. However these sorts of problems contain the possibility for delivery delays if the useless components are detected too late before assembly and shipping and therefore cannot be replaced by new ones in time.

A scenario in the risk assessment model where deliveries would be delayed due to staff incompetence is low in the probability of occurrence but when realizing a grave setback to the core of the company's production logic. The company relies heavily on its management and manufacturing staff to succeed on the lean philosophies they have implemented. This means that the management staff formulates production plans that benefit the company and relies on the production staff to carry out. An important part of this is retrieving sales receivables in time. This means that the manufacturing staff of the company has to from time to time excel in intense pace in order to overcome shortcomings of e.g. suppliers or other restraints in the production process in order to reach its production targets. Occasional failures in reaching these targets would have mostly short term consequences where the case company's cash position would deteriorate for a short period of time as the shipments would not be beneficially aligned with the company's purchases and other expenses. In addition occasional failures in production due to staff incompetence would create some degree of dissatisfaction amongst the clients and especially end users. However if delayed deliveries due to incompetence would become a regular occurrence it would have significant and continuous effects on the company's inventory, delivery reliability and ultimately on profitability and overall turnover. This would force the company to compromise on its lean methods in production and settle for mediocre delivery reliability as well as deteriorated inventory efficiency that has an impact on the profitability. Moreover and more importantly this scenario would slowly but surely demote the company towards the lower segment more generic competitors and probably force the company to lower its prices and thoroughly rethink the company's

position on the market. As a result of this the company would have to ramp down on its expenses such as wages and in worst case the product quality in order to be able compete in the generic market segment. Due to the mentioned factor the potential consequences for incompetent staff are grave and carry a risk of catastrophic downward-spiral type of consecutive and compounding consequences that will accelerate the downfall. Therefore the company recognizes that they have to continue to emphasise the importance of the efficiency of its in house production.

Problems in recruiting competent workforce is also a risk that has the potential to create problems for the company. The case company does not find generic personnel recruitment to be enough to find competent and motivated manufacturing staff according to the case company. Therefore the company uses its social and professional networks to find the best employees for its purposes. Since these networks are limited due to the unofficial nature of these sorts of networks, finding a new employee with the wanted degree of competence and motivation is a demanding task. However the company is confident on its capability to find the best employees due to its reputation as an employer. The company is also heavily invested to find the right people for the jobs due to its business logic that relies heavily on the competence of its in house production.

A situation where the case company would lose a key person or persons, could potentially have grave consequences. The ones that manufacture the products for the company inhouse are high calibre professionals that have learned the company specific processes thoroughly in order be able to work at the required pace. To find a new person and train him or her thoroughly to the various tasks of the company's production would take months. For this time the company's production would slow down and the company would very probably face loss of sales and profitability for that time period.

Inter-company processes

The risk assessment model then moves to evaluate risks that comprise of processes between the case company and other companies in the value chain. The first scenario is if the company is unable to meet new tighter delivery times set by the client. This scenario is somewhat low according to the case company as the majority of the

company's products are purchased as part of larger investments and are therefore carefully planned and ordered in advance. However from time to time the end users need new products on a short notice which demand a faster response from the case company. However the case company's direct clients, the welding and cutting wholesalers, mostly have inventory to spot for single orders. In cases where the clients do not have the needed products in stock the case company will try and expedite the urgent purchase orders to satisfy the end user in hopes to attain customer loyalty. On the other hand due to the special product niche of the case company's products most of the end users are willing to accept longer delivery times than in perhaps on more generic line of industry. In worst case scenario having to switch manufacturing timetables might cause short term production planning mixups resulting into short term decrease in profitability.

Problems occurring in the network resulting from inaccurate forecasts are fairly common according to the case company. This is a result of the fact that the products are consumed mostly along side with larger investments in various metal industries. This furthermore results in the fact that the case company's line of business is high in demand fluctuations. This makes it hard for the network stakeholders to make accurate forecasts about the future since in terms of exactly when the purchases will be ordered. However due to the investment based nature of the product line there is usually a healthy gap between the purchase order and the need for the product by the end user. These factors has led to lean based philosophy in manufacturing of the case company in order to minimize the inventory risk and maximizing its cash position. On the other hand these factors have led to the high margin pricing due to the special and demand fluctuating nature of the product market, which is very possibly the key difference between the case company and the competitors that seem to enter and exit the product market in a short cycle.

Deliveries being delayed or erroneous due to incompatible information systems of the companies is a situation that does not in reality occur due to well established nature and low quantities produced compared to industries of mass production or bulk production. The information systems used are empirically tested for years and have not created problems for the value chain. Therefore the probability is low for this occurrence. In case this would happen however it would create excess inventory for

the party that has made the error and would therefore be considered a short term problems until the product would be sold. On the other hand the the intended purchases would possibly be delayed causing a degree of dissatisfaction amongst the end users.

A situation where client's product life cycles do not match plans is an occurrence that the case company has not had to face yet probably due to the heavy emphasis on quality in the case company's production. This has led the company to consider the possibility of lighten the structure of their products since the product life cycles are somewhat too long. This would also offer a way of cutting on manufacturing expenses as the lighter structures would save on metal consumption the manufacturing. The case company has however come to a conclusion that the leading philosophy of the company is to deliver uncompromising quality to draw loyal customers that know that a higher investment on the products will payback in their own production and in the overall life cycle of the case company's product. Therefore in such re-engineering of the products are commenced only if that does not compromise the quality and durability of the products. Decrease in product life cycle would result into losses in customer loyalty and case company reputation that could have severe long term consequences on both revenue and profitability.

A risk that significant quality problems are not detected prior to delivery to the end client are under current manufacturing and testing methods highly unlikely. This aspect of manufacturing has been emphasized in order to attain the high quality image to customers on which the case company relies heavily on. In addition the established testing routines embedded in production does not carry significant extra costs to the manufacturing process and is significantly less expensive than having to compensate defected products with new ones. Overall large scale problems in terms of quality could have catastrophic consequences that could if compounded end the business itself. This has to do with various factors such as personnel competence that is linked to higher wages that are also linked to the high quality, on which the company has built it business on.

Client product specifications that are inaccurate or erroneous is an occurrence that materializes seldomly. This is due to the established nature of the business as well as fairly high level of knowledge among the clients about the specifications of the

products. Historically there has been cases where client has purchased and delivered a product to the end user after which the end user has understood that the product is not what he had negotiated with the wholesaler. In this situation the case company has sent the right kind of product to the customer after it has negotiated terms that have the wholesaler reimburse the erroneous delivery. In these cases it is important for the case company to have documentation that show that the error has been made by the wholesaler. In addition this is something that has to also be informed to the end user in order to prevent loss of face.

The cases where the network is unfamiliar with the usage environment of the end product are very rare. The demand for the case company's products have appeared organically and the operators that need these products know it themselves or have laws that oblige them to use the products in their production. Although the bases for the environment the products are consumed are mostly self explanatory the case company receives almost regularly queries on how to use products in various situations and environments. Even though these often are quite generic inquiries proposed by end users to clarify key issues on their part the case company understands it has to be very cautious to give specific advice since these questions are from time to time clearly made out of liability reason where the end user wants avoid responsibility on issues or problems that could occur or have already occurred.

A scenario where information regarding changed product requirements is not communicated in the network is estimated by the case company overall as fairly unlikely. Furthermore it is considered very unlikely in the case company's supply chain since all changes are engineered in cooperation with the key suppliers. However the possibility for this kind of a mishap to occur in some of the sales organisations of the wholesalers is not nearly as unlikely. This is derived from the fact that even though the case company is in close contact with the procurement managers at the wholesalers, the sales organisations are widespread all over the globe and are dependent on the information flow of the wholesale companies. Therefore there is always a possibility for misinformation especially on products that have recently been upgraded. On the other hand operating in a special product market means that most of the purchasers and end users are aware of the special needs required on their products and these questions are regularly forwarded to the case company to give solutions to. Therefore situations

such as above mentioned are rare and are often corrected before causing harm in the shape of inaccurate sales made. However the consequences of these kinds of errors would harm the professional reputation of the case company and its wholesalers leading possibly to declining sales as the end user's perceived value of the overall services deteriorates.

A scenario according to the risk assessment model is when delivery problems arise from the delivery reliability of the company's suppliers. This is a key issue when striving to implement lean methods in manufacturing. According to the track record of the case company's suppliers the probability is fairly low. Such setbacks that have an effect on delivery times do not occur even once every fiscal year. However when they have occurred these have had an impact on the company's short term performance since there has been interruptions in production planning as well as cash flow. The company's supplier can be divided into two major groups, generic suppliers that sell ordinary parts and electronic components to the case company. The other group is the key suppliers that are a numeric minority amongst the company's suppliers but that carry out the majority of the company's monetary purchases and therefore the so called pareto -rule applies in this matter. This also means that the generic components can be purchased from various suppliers and there is next to none constraints in procuring these from the markets. However the purchases from the key suppliers are modified to such extent that specifications have had to be communicated with suppliers in order for them to be able to deliver desired components. The risk for bottlenecks in the supply of these products is real and the case company understands it has to maintain continuous relations with these suppliers in order to maximize the benefit of these collaborative relationships.

The delivery time of the company's subcontractors or material suppliers being too long is a risk scenario that has been fairly well dealt with by the case company but that always carry a risk in the on going ventures. As mentioned the case company can procure most of its components without restraints as the company can choose between the best delivery times and prices. On the other hand the case company has been able to negotiate satisfactory delivery times with their key suppliers in order to have sufficient time window for their own lead times in order to reach agreed delivery dates with the clients. In the exceptional situation where a key supplier would want to

radically change terms of the collaboration, the case company has proven to be able to make changes to its supplier base.

The availability of a critical material not being secured and the material not being available when needed is a scenario that might occur in procuring some of the more generic components. Due to the fact that the case company has a variety of suppliers out of which it can choose from amongst the ordinary bulk components. However would this somewhat unlikely situation occur it could very possibly have an effect on reaching delivery times. This would mean in other words short term production planning issues, issues in cash flow and increased customer dissatisfaction that might have a degree of effect for a longer time depending on the customer's size and influence on the market. Unavailability of materials has not historically been a key issue for the case company as often some vendor will be able to send the needed components quickly enough in order to have the delivery sent on time. However this is something the case company will be paying attention to also in the future.

A risk concerning a situation where there is issues in the availability of external services is estimated as semi unlikely in occurrence due to the fact that the service solutions used by the case company are fairly established and generic in nature. This means that company does not consume complex services needed in production or in order to meet production goals. Like many SMEs the case company does not habitually use management consultants or depend on other outside services. The company has its usual software services which have long been a norm on all levels of the manufacturing industry. Furthermore when such a risk would occur the consequence would be experienced in short term. This could have disrupting effects on the case company's production and deliveries, however the company does not see how these could be more than very short term issues. On the other hand when considering outsourced services and consultants, the case company has been evaluating the possibility for taking its lean manufacturing to the next level. In order to do so the easiest way would be to hire a lean consultant that would take the company's lean manufacturing methods to the next level by advising the case company. This is still under evaluation since the company understands that only hiring a consultant will not be enough since implementing lean successfully takes the entire company's commitment and focus in order to be successful.

A risk of a failing partnership is something that occurs very seldomly but its effects have the potential to change the business fundamentally. In other words the company estimates probability for occurrence as low but the consequences as potentially catastrophic. As mentioned before, one of the company's partnerships for decades failed as the supplier's owner base changed and as a result the supplier's core business logic changed in a manner that it was impossible to continue collaboration. For some time the company had to concentrate a large part of its resources on finding a new supplier to do collaboration with. The case company was able to quickly find a substitutive partner of a supplier that had previously been providing the case company with more generic metal components but that had the ability to produce the same quality with more complex configurations. In addition besides the quality the case company has been so far pleased with the levels of commitment in product development with the new collaborative supplier that has enabled relatively many renewals in products in a relatively short time. Therefore, due to factors that in reality are beyond the case company's sphere of influence, the failing of the old partnership has so far proved to be a positive occurrence. Objectively and more generally the case company estimates that on average this sort of a change can lead to hazardous management decision making that can materialize in various ways if the partnering decision proves to be unsatisfactory. Direct effects on quality, delivery times et cetera, can have a detrimental effects on the future of the company. Therefore a failed partnership can be the risk that has the gravest consequences for the case company since it forces the company to react quickly in order to find a reliable supplier, share fairly complex engineering information, broker supply agreements and have all this forged into practice as soon as possible.

4. Findings of the theoretic review compared to the empirical information

The following chapter will concentrate on finding similarities and differences between the secondary material of the theoretical research chapter compared to the findings of the primary case company research material. The chapter will assess each sub chapter of secondary material introduced in chapter two and compare it with the empirical information gathered from the case company.

The comparison is conducted by analyzing the gathered information from the case company representative with the key findings of the different theoretical studies introduced in chapter two. The purpose of this chapter is to extract theoretical knowledge of previous researches on the topic and compare the situation of the case company with them.

For coherence purposes each sub chapter is constructed in the way that first the main findings of each theoretical research under the sub chapter is introduced again after which the comparison of the case company's empiria is reflected and compared to these findings. In addition the titles of the sub chapters are same as the titles in chapter two in order to enhance the readability of the thesis.

4.1. Approaches to supply chain risk management and vulnerability

A main finding of Vilko (2012) as well as Wu & Blackhurst (2009) was that a key for supply chain risk managerial success is the understanding of causal connections regarding the company's supply chain risk environment. Vilko (2012) reckoned that ongoing analysis will enhance the supply chain risk management visibility for the company and is apt to mitigate the realisation and consequence of the risks in the value chain. Wu & Blackhurst (2009) on the other hand emphasized trust between supply chain operators which would consequently enhance e.g. transparency leading to the mitigation of risks in the supply chain.

According to the case company these are valid observations that are to be continuously worked towards in order to improve the company's supply chain efficiency. Constant awareness and analysis of supply chain risk factors are

necessities that keep the company “ahead of the game” and enables it to commence in proactive supply chain management while mitigating the threat of risks from realising as well as the impact of the consequences.

On the other hand where development of supply chain risk awareness is restrained to only some level by resource scarcity which a common occurrence in the SME segment, the development of trust between the supply chain operators is more than merely a resource question. Factors such as strategy and other directive measures control the actions of the other companies in the supply chain, leading to the fact that trust factors are somewhat outside of a single company’s sphere of influence. As witnessed in the empirical part the case company has been able to tie well established relations with its primary suppliers.

However , as was the case with the case company, a change in ownership in one of the most important suppliers led into a drastic change in the company’s strategy which led into the end of a long lasting partnership of the two companies. On the other hand the case company has been struggling in establishing close and transparent relations with the wholesalers, leading into low level of supply chain visibility for the whole of the value chain. This could be seen as opportunism or simply lack of interest in developing partnerships with SMEs by the wholesalers as they are large companies and the sales of the case company’s products do not directly comprise of a significant portion of the wholesalers overall sales and therefore are managed from arms length.

4.2. Managing supply chain risk and capabilities

Sodhi & Tang (2012) defined supply risk management as “*supply chain solutions that ensure supply continues to meet demand in case of a disruption or soon after the occurrence of such a disruption.*” The authors emphasized end to end coverage of supply risks starting from product development and lasting throughout the product life cycle containing the after sales services. This can be seen as a valid point since contemporary business logics are often stressing the meaning of after sales and the ability to ensure supply for e.g. spare parts can be essential in gaining the loyalty of the client when considering the decision for repeated purchases.

Also a main finding of Sodhi & Tang (2012) was the fact that when striving to reduce the consequences of realized risks, companies should put emphasis on reducing their in house production lead times. Lead time efficiency can prevent or at least mitigate the delays of suppliers from materializing into delivery delays of the final product and therefore can be seen as a buffer that revises the mishaps coming up from the value chain.

The case company has in fact realized the very same implication and has been focusing on perfecting their assembly operations as well as maintaining their ability for manufacturing the usually procured components themselves in cases of supply disruptions in order to mitigate delivery delays on their part. The case company has found this to be an effective way of managing supply risks and preventing risks from occurring. However it should be noted that that a significant investment on the staff capability has been conducted and that production lead time efficiency is a continuous point of focus in order to maintain this source of competitive edge.

Jayaram et. al (2014) focused on SMEs that are family owned and came to a conclusion that owner-CEOs are more prone to cost conscious and prudent behavior in their supply chain activities. In addition they are more likely to strive to eliminating waste sometimes at the cost of investments and business development.

According to Jayaram et. al (2014) external CEOs are more determined to perfect the process flow and are often also more likely to invest in information systems and other IT systems. Implementation of information systems and other equivalent IT systems has reduced uncertainty for the companies as the systems produce future oriented data based on the company's past and present performance. This might help SMEs in narrowing the gap compared to larger companies which have access to contemporary information systems and rely on the data gathered by them.

The case company is also balancing its supply chain and manufacturing activities between sufficient delivery reliability in terms of adequate process flow and the elimination of waste by implementing lean philosophy. Short and reliable in house lead times for products are considered by the case company as the best way of protecting from delivery delays and is the focal point that defines how much the case company can rely on lean methods while still maintaining high level of reliability in terms of deliveries. Regarding information systems, the case company considers them to be

average but sufficient for carrying out the tasks expected. This is due the fact that the company ultimately has a fairly small range of products and therefore very sophisticated information systems are not needed in order to do basic projections and maintain stock values et cetera. On the other hand the company's demand is highly volatile and therefore it is difficult to do valid projections even with developed information systems.

4.3. Supply chain risk performance and uncertainty

Zsidisin & Ritchie (2009) examined SMEs operating in b2b markets and found that the typical SME has implemented make or buy decisions where core competences are made in house and items that are not core competences are procured from suppliers often from low cost countries such as China and Eastern Europe.

In addition Zsidisin & Ritchie (2009) pointed out that according to their findings SMEs should shift their focus from cost driven sourcing of items and services to a more risk and consequence based view of their supply chain activities in order to better prepare for possible disorders. This is a point worthwhile examined for any business since while minimizing direct costs of its sourcing activities, in the occurrence of a supply disruption, the indirect and embedded costs of a stock out or delayed delivery might exceed the savings attained by the low direct sourcing costs.

The case company is similar to both of the main findings of Zsidisin & Ritchie (2009). The case company has confined its core competences from its non core competences and has ranked its suppliers by the level of importance and scarcity to critical and non-critical suppliers. The case company procures its bulk components and parts from low cost countries e.g. in the Eastern Europe. On the other hand its most important suppliers operate in Finland. This is partly due to the fact that Finland still has competitive metal industry suppliers since there is a fairly strong heavy metal industry such as ship building, in the country. In addition when procuring its critical components from Finnish suppliers, short shipping times and relatively small sizes are possible which in turn enhances the case company's lean methods applied in its own in house production. This flexibility with its critical suppliers is in addition apt to protect the company from stock outs and further from delivery delays.

Thun et. al (2011) focused on SME supply chain uncertainty and discovered that strict implementation of lean leaves SMEs vulnerable for stock outs and delivery disruptions. In addition small and medium-sized enterprises often show higher dependency and weaker cash flow and equity position compared to large companies which leads to higher supply chain risks. The authors concluded that unlike large corporations, SMEs have not implemented the use of preventive risk instruments such as agreements with sanctions to full potential.

On the other hand the fact that SMEs are more dependent on other companies in the supply chain leading to higher dependency probably inhibits small businesses from forging sanctioned agreements with other companies especially large corporations. This prerequisite might be the barrier that hampers many of the SMEs ability to implement a strict lean discipline since the risks of stock outs and other supplier risks cannot be effectively mitigate with binding sanctioned agreements.

The case company has similar issues in implementing canonical lean manufacturing methods. As long as the case company is unable to reach binding sanctioned contracts with its main suppliers, they are reduced to be operating with incomplete lean methods that are balancing between lean disciplines and stocks kept by necessity. However while without binding agreements, the case company has had success having developed high trust and well functioning relationships with its critical suppliers. Therefore developing trust and mutually beneficial collaboration with its key suppliers might be the way for many of the SMEs in similar situation to conduct their supply chain activities and strive for efficiency in their manufacturing operations

4.4. SME supply chain portfolios: firm satisfaction and organization resources

Having explored the satisfaction of companies towards their supply chain portfolios, Tokman et. al (2013) maintained that the crucial factor for satisfaction is supply chain portfolio flexibility. This meaning that the companies that are able to constantly assess and make needed changes to its supply chain portfolio are the ones that consider to be benefiting the most from having supply chain portfolios.

While the above mentioned cannot be regarded as surprising, it further stresses the fact that the recognition of meaningful supplier relations is a key for successful supply

management. The use of Kraljic's matrix or equivalent as a base for supplier relationship identification is therefore one of the first key steps en route to supply chain management success.

The company seems to be agreeing with the findings of Tokman et. al (2013) as their supply chain activities is mostly concerned about the relations with the main suppliers which are regarded as partners. On the other hand when dealing with more generic suppliers the case company is primarily keen on finding the lowest price amongst above-par quality suppliers. Overall the case company is content with its supply chain performance and supply chain portfolio.

4.5. Collaborative relationships and global SME supply chain performance

While examining supply chain performance and collaborative relationships of SMEs, Eyaa et al (2010) stated that the main key factors in the success of companies are information sharing and openness. Therefore trust is an essential component when building an effective value chain. The parties have to establish sufficient level of trust between them in order to be able to share information without having to dread that the information will be misused by the other party. On the other hand distrust amongst the parties are apt to deteriorate the relations and inhibit partnerships from reaching full potential.

The case company recognizes these issues from their own experiences and agree that the lack of trust and openness often cause friction between the parties and form unnecessary bottlenecks between the supply and demand as well as deliveries. The case company reckons that it is easier for companies to be opportunistic and attempt short term gains instead of genuine cooperation that would be beneficial for all parties in the long run. Contemporary organisation strategies and organisation structures encourages to reap short term profit on an annual quarter basis. On the other hand deep collaboration would require long term commitment and resources to maintain and develop collaboration within the value chain. Therefore the case company states that often there is a *prisoner's dilemma* -type of situation on going where the parties weigh their options and gains between collaboration and opportunism. The case company

estimates that only long time commitment shown from some of these partners or a change of ownership in these companies could restore trust.

According to Tan et al. (2006) increasing global competition has put substantial price pressure on SMEs which has led to higher scrutiny on the management of supply chain. Tan et al. (2006) examined the supply chain operations of SMEs on the viewpoint of key motives, enablers and inhibitors. Key motives can be described by a company's understanding of the essence and importance of effective supply management. On the other hand an enabler could e.g. be successful experiences of past and current partnerships.

However, recognizing the inhibitors plays a vital role when striving to achieve an effective supply chain. According to Tan et al. (2006) the differences in the different business practices and attitudes between the parties inhibits a successful partnership from occurring and the key is to seek and solve the cultural differences and use the knowledge to obtain greater integration between the two parties.

The case company recons that both parties need to pay attention to the needs of the other in order to have successful partnership. However over time company strategies and key personnel change which lead to a more demanding tasks trying to maintain the common grounds on which the partnerships have previously been built on. The case company takes as an example a half a century long partnership with one of its main wholesalers.

The partnership was initially based on the understanding and recognition of mutual benefits but has over the past decade turned into a *tit for tat* relationship where more or less a cynical approach is often the best approach to mitigate the risk of being leveraged by the partner. The case company humorously compares the long lasting partnership to a long lasting marriage which has had its fallouts in the past and is currently based on the quite pragmatic motive of financial stability. In other words the two companies still have the mutual benefits of their collaboration but have grown past the point of enthusiasm of novelty and are not excited to further develop their venture together.

Since the case company possesses the trademarks to the products and since there is a lack of competition in the markets, the wholesaler is somewhat forced to play by the rules of the case company. On the other hand the case company is willing to diversify

its sales channels and understands that the partnership could become to an end if the wholesaler would found an equal alternative to the case company's products. Therefore the two companies could use a reset to their relationship by applying the findings of Tan et al. (2006).

4.6. SME supply chain information sharing

Song et al. (2016) identified transparency and information sharing as the key to enhance supply chain efficiency. According to the authors this means effective two-way communication going both downstream and upstream which result as a way to solve inefficiencies such as the bullwhip effect or supply chain costs.

This enhanced predictability will lead to many positive externalities, most importantly into growing profits. Perhaps the most interesting finding of Song et al. (2016) would be that transparency can also result in better credit quality for SMEs. This being considered widely a bottleneck for SME growth and efficiency, enhanced predictability might encourage lenders to finance more SME ventures. A key issue in reaching this is the lack of trust between many buyer-supplier relations not to mention situations where information should travel from or to 2nd or 3rd tier suppliers. On the other hand a major incentive for developing trust in value chains are the potential mutual benefits for all parties. Enhanced predictability is also an effective tool for supply risk mitigation and should therefore be a topic of interest for any company.

The case company agrees with the potential of effective and sincere information sharing. The case company estimates that improvements regarding supply meeting demand would be drastic and would in many ways enhance the relations of the whole value chain from bottom to top. The key issue according to the case company is also the lack of trust and the excess of opportunism in the short term. A short term mindset does not support openness and information sharing since short term gains are often accomplished with misinformation or misleading information.

The case company gives an example on how a buyer can benefit from having more information than its suppliers and it can use misinformation to leverage against these suppliers. A simple way according to the case company is to shift from buying steadily according to demand to buying large quantities and stock up on a product, creating an

image of increased sales towards the supplier. This could ideally, for the buyer, result in a higher production by the supplier, leading also into an increased inventory for the supplier. The buyer would then gradually sell its stock as expected while the supplier is left surprised with an oversized inventory. This excess inventory would ideally for the buyer be procured with discounts by the time the buyer is again ready to purchase to fill up its inventory. When working these can be benefiting for a buying organization at the expense of its suppliers since the unpredictability can be used against the supplier. The case company reckons that large multinational corporations often obtain a high level of negotiation power and are accustomed to commanding over smaller suppliers. However while this is not the case with the case company since they own rights to their products and are therefore not in the position of an ordinary supplier, it has deteriorated the relations between the case company and its large clients as the terms of business are not the same as the large corporations are used to.

Surowiec (2015) stated that over the past decades supply chain management has become an integral part of strategic business management and a key issue for business managers the world over. While this is the overview of larger corporations, resource scarcity limits SMEs from applying contemporary supply chain doctrines.

According to the study of Surowiec (2015) SME's information flows as well as product flows are smaller leading to higher dependency on its clients and larger corporations in the value chain. The main barriers are: fragmented approaches, lack of integration, inter-firm rivalry, difficulties in the measurement and availability of information and inadequate information systems, leading to that SME often make less attractive partners for large corporations.

The case company recognizes this pattern to some extent, however it disagrees to some extent about the causes resulting to the likeliness of arms length approach by large corporations. According to the case company they would have access and ability to trade beneficial information about production and other factors if these large corporations would provide sufficient information of e.g. demand in exchange. As a part of value chain the case company would benefit from more open exchange of information but would need more valid information about projected sales from its worldwide wholesalers in order to react to this information accordingly. Therefore the case company regards this once again a issue of *trust versus opportunism* since fully

transparent actions regarding e.g. inventory levels on their part could result into opportunistic behaviour from the wholesalers. Until this changes the case company sees its means of enhancing production efficiency as limited to perfecting lean manufacturing and overall process flow with minimal inventory levels.

4.7. Supply chain issues in a SME

Kumar et al. (2012) stated that globalisation has increased the competition between large global corporations and SMEs. At the heart of the study was the finding that well managed and responsive supply chain increases profitability and secures the operations of a company. On the other hand Kumar et al. (2012) found that resource scarcity somewhat hinders SMEs from implementing the desired methods.

The key doctrine of Kumar et al. (2012) was to enhance liquidity by e.g. efficient inventory planning in order to contain the supply risks. The utmost important factor is to understand the uniqueness of the business operations and especially information sharing and coordination mechanisms should be carefully examined before supply chain management systems are implemented.

The case company agrees with the findings of Kumar et al. (2012) and underlines that supply chain management in a global value chain is in the essence of successful management of the overall business. The case company adds that resource scarcity can be mostly compensated with deep understanding of the company's business, value chain and business environment. The case company sees this as a major advantage to many large companies since it is easier for a small company understand its business holistically than it is for a multinational conglomerate.

The importance of a SMEs liquidity position is understood according to the case company as liquidity and restraints for excess credits constitute a harsh reality for SMEs and define the level of daily operations. This has been tackled by the case company by the implementation of lean manufacturing methods that are applied to the capability of the case company in order to maximize cash position.

The risk regarding information sharing is also acknowledged by the case company as many of the internal information regarding e.g. manufacturing could be misused by

others if given access. Therefore e.g. product engineering information is limited to minimum in order to prevent information leaks.

4.8. Development of a service supply model for a manufacturing SME

Hemilä & Vilko (2015) stated that SMEs are agile on picking up methods and best practices from supply service models and implementing them in their supply chain management and overall business model. However according to Hemilä & Vilko (2015) SMEs often have to apply simplified models of supply services due to resource scarcity but also due to the fact that simplified models are often more suitable for small companies with less complexity in their daily operations.

A key finding of Hemilä & Vilko (2015) was that operators that can add customer perceived value by adding valuable services to their product range are often successful in the business environment of today. By adding traditional services such as after sales and logistics, and more contemporary, value adding services that provide untapped value for the customers such as process optimization regarding the use of the products. The key of adding supply services is to grasp the potential of the hidden possibilities regarding excess sales of supporting services to the existing products.

The case company has a will to unleash the potential of support service sales but at the moment it is not actual. The case company recons that it has to first diversify its sales channels and in the progress establish a footing closer to the end users and then venture in the support service markets of the industry. Until now the case company has always been eager to help its clients to solve product related problems and questions pro bono in order to increase sales and understand that it would take investment in terms of resources to create a service model that can be sold to the professional buyers. In addition the case company acknowledges that services of such nature carry liabilities for the company and therefore agree with Hemilä & Vilko (2015) that the implementation of potential future services should be thoroughly assessed and tested before entering the market.

5. Conclusions and Managerial Implications

The following chapter will be assessing the main findings of this thesis by concluding what the thesis has been able to extract from the literature review and the empirical part. The chapter will provide the conclusions for SME supply risks assessment by offering an extract of the managerial implications gathered while conducting this thesis. When conducting a thesis the ultimate objective is to answer the questions of the potential readers who bear an interest towards the topic and the academic domain that the research is aimed for. The aim of this thesis has been to extract information about SME supply risks and therefore the primary interest of this thesis should be to offer practical implications for SME business owners and managers as well as endorse future research on the topic.

The following chapter will summarize the main findings of the thesis and provide SMEs with a simplified checklist for practical use about supply chain risk assessment. The thesis has extracted the main points of SME supply risk assessment and the following will give practical guidelines on how to take on these challenges.

5.1. Conclusions

Vilko (2012) and Wu & Blackhurst (2009) both stressed continuous work in regards of trust, transparency and openness within the value chain. The empirical knowledge extracted from the case company demonstrated that changes in ownership and strategy of a collaborative partner might change the dynamics of a partnership rapidly and therefore further showcases the importance of having well established and communicated relations where the mutual benefits of the partnership are apparent for e.g. new personnel of new owners that take over the operations of the partner company. This is particularly eminent in the contemporary global business environment where both strategies and key personnel change in a rapid pace.

Sodhi & Tang (2012) emphasized the importance of reducing lead times in order to protect from supply disruptions and decreasing the overall vulnerability of the company. Liquidity is of major importance to any company especially SMEs and therefore when striving for the reduction of lead times, *lean* methods are worthy possibility to consider. According to the case company, lean methods are essential in attempts to cut out the excess from both production times and inventory. When assessing the findings of Jayaram et al. (2014) and the information extracted from the case company, when concentrating on perfecting core competences and in house activities, a company can protect itself from supply mishaps by having capabilities to recover from supplier delays instead of having excess inventory as a buffer that decreases liquidity. Therefore a lean outlook on in house production is essential while perfecting supply reliability with the suppliers and decreasing vulnerability.

In order to reach the goals of reduced lead times and overall performance of process flow, the research of Zsidisin & Ritchie (2009) provides a finding that is apt to increase supply reliability. The authors state that when selecting a collaborative partner, reliability and overall collaborative preparedness should be stressed over a direct cost based assessment. The direct costs of a high quality partner might be higher than the cheapest possible option, but choosing a reliable partner prevents hidden costs such as quality defects and delivery delays from realizing which play a significant part in the perceived value and customer satisfaction and loyalty.

For a SME to reach a state where delivery reliability and quality of its suppliers are at demanded level, Thun et al. (2011) suggest that even smaller companies should seek to tie sanctioned supply agreements where the key aspects of the products sourced are contractually binding. As this in general is challenging for SMEs due to the lack of both resources and negotiation power, the SMEs should alternatively replace the lack of contractual binds by maintaining close and mutually beneficial relations with its key suppliers.

Tokman et al. (2013) state that a way of maintaining the knowledge where to allocate these supply chain resources should be conducted by constantly assessing the company's supply chain portfolio. By using and updating e.g. the Kraljic's Matrix on its suppliers will give a company the knowledge on which suppliers are the most crucial

for the company and should therefore be given the excess attention when considering supply chain relations.

Once these key suppliers are identified and resources of the supply activities are allocated to enhance these relations, trust between the parties should be established in order to enable a smooth supply chain flow. The findings of Eyaa et al. (2010) and the information extracted from the case company suggests that trust should be advocated towards the collaborative partners in order to tie relations that are functioning in the best possible manner. Tan et al. (2006) encourages companies to seek and recognize mutual benefits from the collaboration for both parties to understand what they are getting in exchange for their collaboration.

These enablers are a key when maintaining a successful collaboration. However in reality trust can be leveraged against a company if the other partner is not content with only gaining win-win type of gains for both parties. As showcased in *the prisoner's dilemma* opportunistic behaviour can result in the so called *sucker's payoff* for the trusting partner if the other company decides to leverage on this trust. Therefore while building trust in collaborative relationships companies should always bear in mind that opportunism might occur and prepare to take actions against it when realized.

Song et al. (2016) encourages to enhance transparency to further consolidate trust among partners and Surowiec (2015) establishes that open communication is a key success factor in a successful partnership. However companies should also beware of spilling information about core competences and business secrets since this is apt to deteriorate the company's negotiation power and even jeopardize the existence of the company.

When considering strengths of SMEs compared to large companies who compete against each other or operate in the same value chain, Kumar et al. (2012) suggests that SMEs should invest in the deep understanding of the business environment. Large corporations might lack in substance knowledge and deep understanding of the business environment due to changes in personnel and strategy. In addition large corporations have significantly more difficult to communicate within their organisation resulting in situation where the lower echelons might be unaware of what exactly the upper echelons of the company desires to be done. Understanding these realities and

being more agile in tackling the issues at hand might give a proactive SME the needed edge to make up for some of the weaknesses compared to large corporations.

A result of implementing this agility into practice could be the main finding of Hemilä & Vilko (2015) which suggests that finding and adding solution services to support the sales of the actual products could become a positive cycle where support service solutions would add product sales and product sales would enhance support service solutions while diversifying the overall offering of the company. These sorts of additions to the offering could be a decisive factor that would make a company to stand out on a global scale market from competitors.

5.2. Managerial implications

As a conclusion the following presents a managerial shortlist of the findings in this thesis. These guidelines are extracted from the main findings from both the literature review and the empirical part. The shortlist of the main managerial implications of this thesis is as follows:

- 1. Strive to perfect your in house production in order to reduce lead times and maximize you liquidity position by implementing lean*
- 2. Favour reliability over cost in partnership selection*
- 3. Forge sanctioned supplier contracts in order to consolidate your ability to implement lean*
- 4. Assess your supply chain portfolio continuously in order to allocate resources accordingly*
- 5. Advocate trust in a partnership by enhancing transparency, but prepare to face opportunistic behaviour and changes in partnership dynamics over time*
- 6. Understand your business environment and use your size to your advantage in order to seize emerging business opportunities*

As the thesis has shown, lean implementation is valuable for a SME in order to standardize lead times by examining and perfecting the company's in house production. In addition by implementing lean the company will maximize its liquidity position by achieving optimal inventory levels.

Another managerial implication this thesis has revealed is that SMEs should favour quality and reliability factors over direct costs when selecting partnerships. Suppliers

that are elevated and viewed as strategic partners, deliver valuable supply to the company and are not to be selected by the same criteria as bulk supplier.

The thesis also implies that SMEs should mimic large companies by attempting to forge sanctioned supplier agreements where binding delivery reliability standards are set. This would further assist SMEs that are trying to implement lean since the sanctioned agreements would further consolidate the supply material flow and mitigate delivery errors. However the thesis has also established that due to mostly negotiation power matters, sanctioned supplier agreements might be difficult to obtain in many cases and are often to be replaced by advocating an open and mutually beneficial partnership.

Another key implication of the thesis is that in order to be successful in supply chain operations SMEs should continuously assess their supplier relations in order to identify strategic and bottleneck suppliers and to allocate supply chain resources accordingly. While these resources are often allocated on need-to-do bases, it is vital for companies to examine their suppliers to understand possible supply risks in order to act in advance instead of having to react later.

As mentioned in the thesis many times over, trust is a key to any business relation and the lack of it is often the downfall of many potential improvements. Therefore the results of this thesis imply that trust should be advocated in a partnership, however according steps towards having to deal with opportunistic value chain behaviour should be taken. This means that while building trust SMEs should bare in mind not to be exposed to serious risks if a partner chooses to leverage on that openness and loyalty. A point also made in the thesis is that the dynamics of a successful partnership can change rapidly e.g. in cases of ownership changes et cetera.

The final managerial implication of this thesis is to thoroughly understanding your business environment and using your size as an advantage when seizing emerging business opportunities. SMEs have many weaknesses compared to large companies, but being a SME often means that your directors are more attached to the grassroots level of the everyday business leading to a better view of the operations. This combined with the manager's possible abilities as a visionary might result in the company grasping emerging business possibilities with success.

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Appendices

Appendix 1.

The Risk Assessment Model

The consequence is assessed in a scale of one to five:

- 1 = No effect.
- 2 = Minor effect.
- 3 = Moderate effect.
- 4 = Major effect.
- 5 = Catastrophic effect.

The probability is assessed in a scale of one to five:

- 1 = Very small.
- 2 = Minor
- 3 = Moderate
- 4 = Major
- 5 = Very large.

| Risk or cause of risk | Consequence | Probability |
|---|--------------------|--------------------|
| Changes in client company ownership or mergers | 3 | 2 |
| The client reduces the number of its suppliers | 3 | 3 |
| The client shifts its focus and the core competence of the company does not support the new focus | 4 | 3 |
| The client finds more competitive suppliers from outside of the network | 4 | 2 |
| The client requires internationalisation | 1 | 3 |
| Creation of larger deliveries | 1 | 3 |

3.2 Demand-related problems or small number of orders

Background questions:

| | | |
|--|-------------|--|
| How many major clients do the company have? | >3 | |
| How large a proportion of the total production does one of the major clients constitute? | >75% | |
| Is there demand or use for the company's core competence outside the present clients? | Yes, enough | |
| Does the company have experience and competence in marketing and customer acquisition? | yes | |

Demand from the customers of a major client decreases

Consequence
1-5

Probability
1-5

Demand in the industrial sector generally
Decreases or growth of the sector
Unexpectedly ceases

3

4

A declining trend begins in a region with
a significant number of end clients
(clients of the company's clients)

3

4

| Problems related to a major client's product sales | Consequence 1-5 | Probability 1-5 |
|--|----------------------------|----------------------------|
| The competitive strength of the client's products diminishes | 3 | 3 |
| Orders are larger than predicted | 2 | 4 |
| Orders are smaller than predicted | 3 | 4 |
| The client's new product model or its timing in the market fails | 3 | 3 |
| An end client does not trust client's network capacity | 3 | 2 |

| The position of the company as part of the client's supplier network weakens | Consequence 1-5 | Probability 1-5 |
|---|----------------------------|----------------------------|
| The ownership of the client company changes or the company becomes merged with another company | 4 | 2 |
| The client reduces the number of suppliers in order to increase delivery sizes | 3 | 3 |
| The client's demands pertaining to technology or volume change and the company is unable to meet the new requirements | 3 | 2 |
| The company loses the client's trust due to insufficient delivery reliability | 3 | 2 |
| The company loses client's trust due to issues related to quality | 4-5 | 1 |

| | | |
|--|---|---|
| The company loses the client's trust due to disclosure of confidential information | 4 | 1 |
|--|---|---|

| | | |
|---|---|---|
| The client chooses a more competitive supplier from the outside of network e.g. a large corp expanding its market share | 3 | 2 |
|---|---|---|

| | | |
|---|---|---|
| The position of the company in the client's network deteriorates due to lack of resources for internationalisation required by the client | 3 | 2 |
|---|---|---|

| | | |
|---|---|---|
| The company expands to the international Market with the client, but the demand does not meet the expectation | 3 | 1 |
|---|---|---|

| | | |
|---|----------------------------|----------------------------|
| Issues related to production experienced by other suppliers in the network affect the company's volume | Consequence 1-5 | Probability 1-5 |
|---|----------------------------|----------------------------|

| | | |
|--|---|---|
| The company's volume of orders is reduced because problems pertaining to delivery or capacity occur in the network | 3 | 2 |
|--|---|---|

3.3 Problems related to cost control or pricing

Background questions:

| | |
|---|--------------------|
| Does the company know the cost structure of the client's end product? | Yes, approximately |
| Has operation in the network caused changes in the pricing of products or price level? | No |
| Is open-book pricing used? | No |
| Has operation in the network changed the company's cost control or cost calculation system? | No |
| Are the company and the client working together to decrease costs? | No |

| Problems in the calculation or control of production costs | Consequence | Probability |
|--|-------------|-------------|
| | 1-5 | 1-5 |
| Cost accounting is providing unreliable information on output-based costs | 3 | 2 |
| The price level of raw materials or produced components rises significantly | 3 | 2 |
| The company does not receive a price benefit for acquisitions as the main acquirer | 2 | 2 |

| | | |
|---|---|---|
| The price level of the company's subcontractors increases | 3 | 3 |
| Labour costs increase | 3 | 3 |
| Expenses do not correlate with volume fluctuations | 3 | 3 |
| Low predictability of demand causes extra costs | 3 | 4 |
| The production equipment of the company is incapable of cost-effective production | 3 | 2 |

| | | |
|--|----------------------------|----------------------------|
| Larger responsibility and more extensive products set additional requirements to the company operations, causing expenses to rise | Consequence 1-5 | Probability 1-5 |
|--|----------------------------|----------------------------|

| | | |
|--|---|---|
| Working capital becomes too large as the business volume increases | 3 | 3 |
| As a result of larger wholes, working capital increases | 3 | 4 |
| Responsibility for buffer stocks is shifted from the client to the company | 3 | 3 |

| | | |
|----------------------------------|----------------------------|----------------------------|
| Investment costs increase | Consequence 1-5 | Probability 1-5 |
|----------------------------------|----------------------------|----------------------------|

| | | |
|--|---|---|
| Expansion investments increase the company's | 3 | 2 |
|--|---|---|

debt-equity ratio

| | | |
|--|---|---|
| Investments become too large in proportion to the resources of the company | 2 | 2 |
|--|---|---|

| | | |
|---|---|---|
| Internationalisation or pressure to internationalise cause great investment needs | 2 | 2 |
|---|---|---|

| | | |
|--------------------------------------|---|---|
| The cycle of investment is increased | 2 | 2 |
|--------------------------------------|---|---|

| | | |
|------------------------------------|---|---|
| A wrong type of investment is made | 2 | 2 |
|------------------------------------|---|---|

| | | |
|---|---|---|
| Investments are focused on too narrow a field of expertise, for which there is no use in the future | 3 | 3 |
|---|---|---|

| | | |
|---|---|---|
| Investment criteria prove to be erroneous i.e estimated investment income or expenditure is not realised as estimated | 3 | 3 |
|---|---|---|

| | | |
|--|---|---|
| A client-specific investment is made, for which, after a product has failed, there is no use | 3 | 2 |
|--|---|---|

| | | |
|---|---|---|
| The company is pressured to make larger investments | 2 | 2 |
|---|---|---|

| | | |
|---|----------------------------------|----------------------------------|
| The price or availability of money causes problems for the company | Consequence 1-5 | Probability 1-5 |
|---|----------------------------------|----------------------------------|

| | | |
|----------------------------------|---|---|
| Interest level increases rapidly | 2 | 3 |
|----------------------------------|---|---|

| | | |
|---|---|---|
| Exchange rate fluctuations cause interest losses or margin problems | 3 | 3 |
|---|---|---|

| | | |
|---|---|---|
| Financing is a significant bottleneck in the development and expansion of the company | 2 | 2 |
|---|---|---|

Product pricing causes problems

| | | |
|---|---|---|
| The pricing policy of the company fails | 3 | 2 |
| Price competition in the sector gets out of control | 4 | 2 |
| The client has great control over the product price | 2 | 2 |
| Prolonged decline of prices weakens profitability | 3 | 2 |
| The client requires an unrealistic price reduction on a short notice | 2 | 2 |
| The company is unaware of the additional value of the product to the client | 2 | 2 |

3.4 Problems meeting delivery criteria (delivery times or quality)

Background questions

| | |
|---|------------------|
| How many per cent of the information flow of the company's order-delivery process is communicated electronically | >70% |
| How do the delivery times of goods purchased by the company compare to delivery times of products made by the company | Roughly equal |
| Level of strategic cooperation in the supply chain <ul style="list-style-type: none"> - With clients - Between suppliers | Moderate High |
| Number of replacement subcontractors for the company | Moderate |
| At which stage of the product life cycle is the cooperation primarily carried | Early |

| Internal processes of the company | Consequence 1-5 | Probability 1-5 |
|--|--------------------|--------------------|
| Defaults in product planning cause problems in meeting delivery expectations | 3 | 1 |
| Company's ability to manage projects is insufficient for large-scale deliveries and deliveries requiring extensive knowledge of technology | 2 | 2 |

| | | |
|---|---|---|
| Errors and usability of the company's ERP system negatively impact the meeting of delivery requirements | 3 | 1 |
| Insufficient stock prevents the fulfilment of delivery in time | 3 | 2 |
| Long-term machinery or staff capacity is insufficient to meet increased demand | 3 | 2 |
| Recurring unexpected problems and interruptions in production resulting from long setup times or new product models | 3 | 1 |
| Insufficient production equipment service reliability and performance | 3 | 2 |
| Productions delivery cycle is too long or its predictability varies greatly | 3 | 1 |
| Too vast product range makes production process difficult to control | 3 | 2 |
| The company experiences problems in meeting the client's quality criteria | 4 | 2 |
| Raw material in stock is useless or otherwise inappropriate for the end products | 3 | 2 |
| The fulfilment of delivery criteria is difficult due to staff incompetence | 4 | 1 |
| Problems in recruiting competent workforce | 4 | 2 |
| The company loses a key person or persons | 4 | 3 |

| Inter-company processes | Consequence 1-5 | Probability 1-5 |
|--|----------------------------|----------------------------|
| The company is unable to meet new tighter delivery times set by the client | 3 | 2 |
| Problems occur in the network resulting from inaccurate forecasts | 3 | 3 |
| Deliveries are delayed or erroneous due to incompatible information systems of the companies | 3 | 2 |
| The client's product life cycles do not match plans | 3 | 2 |
| Significant quality problems are not detected prior to delivery to the end client | 4-5 | 2 |
| Client product specifications are inaccurate or erroneous | 3 | 2 |
| The network is unfamiliar with the usage environment of the end product | 3 | 3 |
| Information regarding changed product requirements is not communicated in the network | 3 | 2 |
| Delivery problems arise from the delivery reliability of the company's suppliers | 3 | 2 |
| Delivery time of the company's subcontractors or material suppliers is too long | 3 | 2 |
| The availability of a critical material has not been secured and the material is unavailable when needed | 3 | 2 |

| | | |
|---|---|---|
| Issues in the availability of external services | 3 | 2 |
| A partnership fails | 4 | 2 |