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SUPPLIER DEVELOPMENT AND COLLABORATION

- Influence of lean philosophy and principles in supply management

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ABSTRACT

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The purpose of this study was to shed light on firstly (1) how companies' are conducting supplier relationship management, how supply management personnel are collaborating with suppliers and what is the role of supplier development. And secondly (2) to investigate if companies are applying Lean philosophy and principles in supply management, supplier development and collaboration. The aim was also to find out the enablers and obstacles that influence supplier development activities. In addition, the target was to find out the current situation of lean philosophy adoption and its principles and practices that companies utilize in supply management.

Lean philosophy and principles are widely adopted into manufacturing operations and processes while the expansion of lean to the other functions of a company and the utilization of lean has not maybe been realized on the same extent. The research was carried out by conducting a multiple comparative case study, all from a buying company's perspective, using qualitative research methods. Four comparisons were executed: one intra-company comparison between three different direct categories, and three inter-company comparisons. It was found out in the research that continuous improvement and waste elimination are widely in use. However, the companies have not deployed the whole potential that lean brings along and the expansion of the philosophy utilization outside of the company to upstream in the supply chain is a work in progress.

TIIVISTELMÄ

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Tutkimuksen tavoitteena oli valottaa ensinnäkin (1) miten yritykset toteuttavat toimittajasuhteiden hallintaa, kuinka hankinnoissa kollaboroidaan toimittajien kanssa ja mikä on toimittajakehityksen rooli. Ja toiseksi (2) tutkia käyttävätkö yritykset lean filosofiaa ja sen toimintaperiaatteita hankinnoissa, toimittajakehityksessä ja kollaboraatiossa. Tavoitteena oli myös selvittää mitkä tekijät vaikuttavat yhtäältä mahdollistajina ja toisaalta estäjinä toimittajakehityksessä. Lisäksi tavoitteena oli selvittää lean filosofian omaksumisen nykytila ja mitä lean toimintaperiaatteita ja käytäntöjä yrityksen käyttävät hankinnoissa.

Lean filosofia ja sen toimintaperiaatteet on laajasti omaksuttu valmistuksen toiminnoissa ja prosesseissa, mutta filosofian laajentaminen ja periaatteiden käyttö yrityksen muissa toiminnoissa ei ole ehkä toteutunut samassa laajuudessa. Tutkimus toteutettiin suorittamalla laadullisin tutkimusmenetelmin monitapaustutkimus ostavan yrityksen näkökannasta. Neljä eri vertailua toteutettiin: yksi yrityksen sisäinen vertailu, jossa verrattiin kolmen eri suorien ostojen kategorioiden toimintaa, ja kolme yritysten välistä vertailua. Tutkimuksessa huomattiin, että lean toimintaperiaatteista jatkuva parantaminen ja hukan vähentäminen ovat laajalti käytössä. Yritykset eivät ole kuitenkaan ottaneet käyttöön koko leanin tarjoamaa potentiaalia ja filosofian käytön laajentaminen yrityksen ulkopuolelle toimitusketjussa ylävirtaan on kesken.

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Now this thesis is ready. I have to say that the process was more ample than I anticipated, requiring more time and patience. Luckily I am quite persistence by nature. However, carrying out the research has been an interesting process and “a little researcher” woke up inside of me. I have learned a lot and developed greatly as a writer.

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Espoo, May 2018

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ABBREVIATIONS

10xB	“ten times better”
APQP	advances product quality planning
ARM	annual review meeting
ASCC	advanced supply chain collaboration
CAPA	corrective actions preventive actions
CIPS	continuous improvement process - sourcing
COT	complete on time
CTQ	critical to quality
DA	diagnostic audit
ECI	early contractor involvement
ECN	engineering change notice
EDI	electronic data interchange
EFR	early failure rate
EMS	electronics manufacturing service
eRFQ	electrical request for quotation
ERP	enterprise resource planning
ESI	early supplier involvement
FMEA	failure mode and effect analysis
FYCOR	first year callout rate
IT	information technology
IoT	internet of things
ISO	international organization for standardization
JIT	just-in-time
KPI	key performance indicator
LM	lean management
LMS	lean management system
LSCM	lean supply chain management
LTT	in Finnish: “*luotettavan tuotannon toimintatapa”,* operation mode of reliable production
LUSCM	lean upstream supply chain management

MIT	Massachusetts Institute of Technology
MPA	manufacturing process audit
NDA	non-disclosure agreement
NN	not named
NPCI	new product or change introduction
NPD	new product development
NPI	new product introduction
ODM/OED	original design manufacturing/equipment design
OEM	original equipment manufacturer
OHSAS	occupational health and safety assessment series
PCC	percentage plan completed
PDCA	plan, do, check, act
PDM	product data management
PE	product engineering
PFR	production failure rate
PMO	project management office
PO	purchase order
POL	purchase order line
PPAP	production part approval process
PQP	product quality plan
QBR	quarterly business review
QDC	quality delivery cost
QIT	quality improvement team
QPO	quality passport organization
QSA	quality system audit
RFCA	request for component approval
RFI	request for information
RFQ	request for quotation
RoHS	restrictions of hazardous substances
ROI	return on investment
RST-NS	replacement shipment in time – non-stock
RST-S	replacement shipment in time – stock

SCM	supply chain management
SD	supplier development
SEC	supplier excellence certification
SMED	single-minute exchange of die
SMP	supplier management portal
SOPM	Supplier operations project management
SPC	statistical process control
SPE	supplier performance evaluation
SQD	supplier quality development
SQM	supplier quality management/manager
TCO	total cost of ownership
TPS	Toyota production system
USCM	upstream supply chain management
VSM	value stream mapping

1 INTRODUCTION

Nowadays individual companies are rarely winning a market share by competing against each other. Business competition is often happening between supply chains. (Drohomeretski et al., 2012). This has led to the need to align strategically and operationally different parties within the supply chain.

Purchasing function spends company's resources for buying items (raw material, component, modules) or services for running the production, for maintenance purposes and for overall administration of the company. In manufacturing companies approximately 60 % of total spend are due to purchasing. (Ellram and Siferd, 1998). Throughout relationship integration with a supplier a company can gain many opportunities and business benefits such as excellent performance at delivery, prompt reaction time to requests, delivering agreed quality level products and reducing time-to-market time (Hines and Taylor, 2000, 4).

Lean philosophy and methods have been implemented deeply and widely when it concerns the production processes. Lean Manufacturing (LM) has been successfully adapted in increasing number of companies. The reason for this is the fact that following lean thinking and principles (e.g. eliminating waste) in manufacturing influences significantly cost reduction, related to quality standard increase. (Drohomeretski et al., 2012). The adoption of Lean philosophy to the supply chain (e.g. external processes with suppliers) is important to be able to deploy the whole potential of Lean in the value chain.

Linking and seamlessly connecting lean manufacturing processes with lean supply chain management and upstream supply chain management processes have considerable influence on the end customers' experience. Even though companies acknowledge suppliers' direct influence on the value creation through prompt delivery performance, providing excellent quality and flexibility in operations, there exists many barriers and obstacles which hinder this evolution. Further research is needed on the topic of how companies are utilizing lean philosophy and principles in supplier relationship management, supplier development and collaboration in order to gain the full potential of the chain.

1.1 Research gap

Companies are concentrating more and more on one's core competencies. This means that outsourcing activities are increasing and playing on the global market field is reality to many companies. Due to heavy outsourcing activities, a company can face multitude problems and complexity in product development and when launching products. (Helmold, 2011).

Even though many companies are following lean philosophy and principles in their own production and facilities many of them have not integrated their suppliers into "the lean chain" and are not applying lean concept toward suppliers. For the company success, it is important that upstream supply chain (USCM, value chain toward suppliers) is streamlined and managed following lean principles. This means that activities and processes should be lean toward suppliers. A company cannot achieve the full potential and success offered by lean if lean principles are not implemented throughout the whole chain, leaving suppliers out. Helmold (2011) argues that a company can gain benefits and cost savings if it integrates lean into its supply chain and starts the elimination of the waste according to the lean principles.

Taking suppliers along requires professional PSM (purchasing supply management) personnel. (Helmold, 2011). Supplier relationship management (SRM) plays a significant role when rolling out lean thinking toward suppliers and starting to follow the philosophy accordingly. This means (1) harmonizing processes, (2) identifying errors, (3) eliminating waste, and (4) starting continuous improving actions and follow up. If USCM is properly managed and lean is implemented toward suppliers, the company can achieve significant competitive advantages compering to its competitors. Prajogo et al. (2016) state that the supplier's performance is building company's competitive advantage through delivering on time high quality level raw material, components and products with competitive prices. Barla (2003) argues that it is essential to tight the collaboration with the supplier to enable the supplier's prompt actions, just-in-time deliveries and agreed quality level products, components or raw material. Improving only production processes (i.e. lean manufacturing, LM) is not enough. If doing this, a company is not utilizing the whole potential.

Wilson and Roy (2009) argue that lean procurement is a key method for achieving financial and efficiency targets by inventory reduction. Lean procurement is understood to consist of the elements as: purchasing small amount and frequently and working only with a few suppliers. This emphasizes JIT (just-in-time) method. Prajogo et al. (2016) pointed out in

their research that the production which is following lean principles and inbound supply performance are bonded, supply efficiency is positively affected by lean manufacturing processes. Increasing competition has woken up companies to realize that taking suppliers along to the common shared value chain and genuinely integrating external inbound supply chain processes into the whole value chain have significant impact on the performance and this strengthens the company's status on the market. (Prajogo et al., 2016)

Due to the current phenomenon of companies concentrating core-competencies and outsourcing heavily other activities, importance of supplier relationship management has heavily increased. It is obvious that the supply chain management is in the key role by offering competitive advantage to a company's financial performance. This has led companies to a situation that there is need for tight supplier collaboration and supplier development activities: role of suppliers has increased, and companies have started to understand the strategic value of prompt supplier relationship management. (Praxmarer-Carus et al., 2013). Due to the tighter linkage a company has with its suppliers, importance of controlling and developing suppliers' performance is in a crucial role. Krause et al. (1998) argue that the buying company's needs must be fulfilled and secured by prompt supplier performance and development.

Krause et al. (1998) argue that supplier development as an academic research topic has been disregarded and ignored by the researchers even though by investing and making effort on supplier development companies can gain multiple benefits and competitive advantage on the markets. Also, Wagner (2006) states that there is a lack of adequate empirical supplier development research. In addition, Dalvi and Kant (2015) bring out the research limitation and implication on their literature review. They argue that there is not available sufficient literature concerning practical difficulties concerning supplier development activities. These findings concerning the research gap and the before mentioned facts of importance of supplier relationship management's role and lean supply led researcher to the conclusion that conducting the empirical comparative multiple case study research is essential.

1.2 Research questions

The objective of this research is to form a view of the supplier development and collaboration, and utilization of Lean philosophy and principles at supply management. This research is executed by utilizing theory and findings from other researches by conducting comprehensive literature review, and combining findings from empirical research. The empirical part of this research is conducted by interviewing the selected company. The target is to investigate how selected companies see the supplier collaboration and development as activities belonging to supplier relationship management. The main research question is formed as:

***RQ1**: How are companies collaborating with suppliers and how is supplier development conducted?*

After the help of the main research question, when formed the current practices of supplier collaboration and development, the researcher aims to find out the success factors and obstacles which have an influence on supplier development. The second research question is formed as:

***RQ2**: What are the success factors and obstacles in supplier development?*

After these questions this research digs more deeply into lean philosophy and principles. With this third research question the researcher aims to understand the current position of lean in supply management. The target is also to examine how companies' sourcing and procurement perceive the applicability and usefulness of lean philosophy which is traditionally related to manufacturing processes. The third research question is formed as:

***RQ3**: How are companies applying Lean principles in supply management, and in supplier collaboration and development?*

Being guided by these research questions through the study the researcher aims to form a view of the current status of companies' supplier collaboration and development and how lean philosophy and principals are deployed to upstream supply chain management.

1.3 Research framework

The conceptual framework of this study is formed as illustrated on the following figure (Figure 1) and is defined as: Implications of lean philosophy and principles on supplier relationship management concentrating on supplier collaboration, supplier performance management and supplier development.

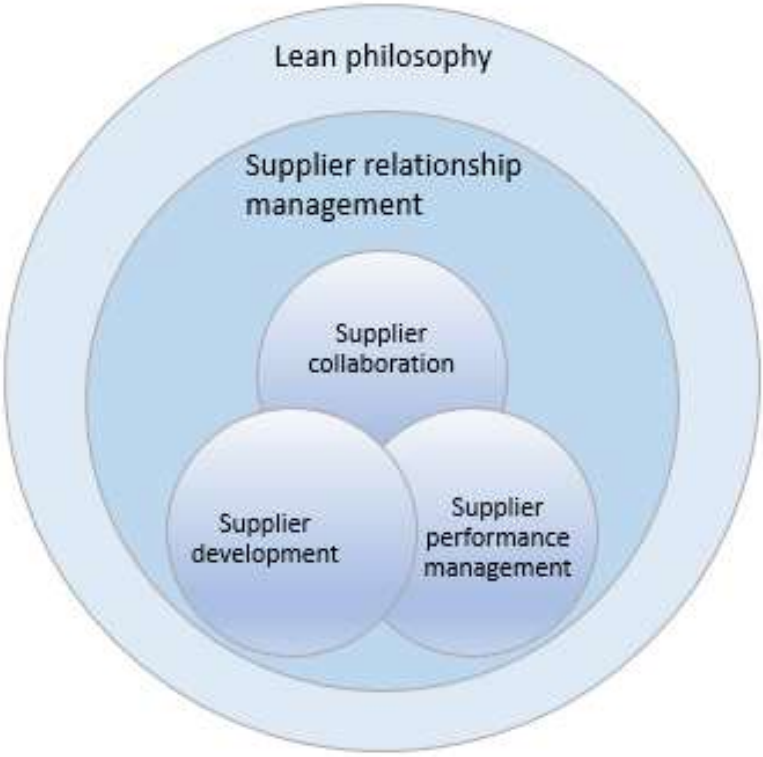

Figure 1: Conceptual framework

When scrutinized closer at the core functionalities of this framework supplier collaboration is defined to include features such as meeting practices, trust, tools, early involvement; supplier performance management includes features such as metrics, follow-up, evaluation process; and supplier development includes features such as development potential identification, development process. The figure below (Figure 2) illustrates the content and the process discipline of the core functionalities of the framework.

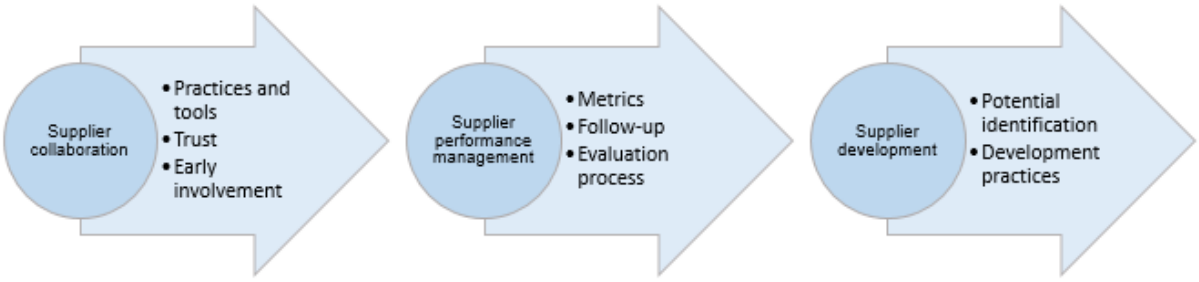

Figure 2: Core functionalities of the framework

1.4 Definition of key concepts

The key concepts of this study are (1) *Lean*, (2) *supply chain management*, (3) *lean supply chain management*, (4) *supplier relationship management*, (5) *supplier collaboration,* and (6) *supplier development.* The definitions for key concepts used at this study are following:

(1) Lean

Myerson's definition of Lean is the following (2012, 2): "Lean is a team-based form of continuous improvement that focuses on identifying and eliminating waste." Lean principles can be interpreted also as "the effects and combination of which are essential for success" (Helmold, 2011).

(2) Supply chain management (SCM)

Supply chain management can be defined and understood in many ways. I.e. in some companies supply chain management function consists only purchasing and sourcing and in other companies also logistics, warehousing and delivery centers are included in SCM organization. (Myerson, 2012, 3-4). In this study supply chain management function is defined consisting only purchasing and sourcing. This is also called upstream supply chain management (USCM) which indicates value chain toward suppliers (Helmold, 2011).

(3) Lean supply chain management (LSCM)

Lean manufacturing alignment with the supply chain, both upstream and downstream, is called Lean Supply Chain Management (LSCM). (Drohomeretski et al., 2012). Lean upstream supply chain management (LUSCM) indicates the lean value chain toward suppliers. This study is concentrating on LUSCM.

(4) Supplier relationship management (SRM)

Supplier relationship management is a function belonging to supply chain management. Supplier relationship management can be defined as a process which consists features, namely sub-processes such as set-up, develop and stabilize relationships, which aim to improve overall performance (i.e. improved supplier relationship performance leads to improved financial performance) (Moeller et al., 2006). Lambert (2014, 11) states that a company should create close relationships with its key suppliers and maintain traditional relationships with suppliers which are not defined as strategic key suppliers for a company. Park et al. (2010) define SRM framework which include purchasing strategy, supplier selection, collaboration, supplier assessment and development followed by continuous improvement from lean philosophy. This study concentrates on collaboration, supplier performance management (assessment) and supplier development. SCM strategy and supplier selection and contracting are excluded from this study.

(5) Supplier collaboration

Supplier collaboration in this study means the practices (e.g. meetings, collaboration tools) and level of communication and sharing information. Supplier collaboration is essential at lean supply chain. Concerning SRM, relationships with suppliers should be collaborative and cooperative. This means, sharing information and working closely together increases supplier involvement and ability to achieve common goals that have been set together. As a result of having trust in the relationship both parties are working together for developing new products (early involvement at R&D; research and development) and business opportunities. (Trent, 2008, 32–33). More about supplier collaboration on chapter three.

(6) Supplier development

Dalvi and Kant (2015) define supplier development as: "*Supplier development is a kind of collaboration among a buyer and a supplier to seek constant improvement in supplier performance and capabilities to provide better quality, on-time delivery of products and services at lower cost*." Deeper insight and overview of supplier development is offered on chapter five.

1.5 Structure of the study

The structure of this study is the following: in this first chapter the background for this study is introduced, research gap is identified, research questions and framework are presented and definitions of the key concepts are given. Chapters two, three and four belong to the theoretical part of this study. In these chapters the theoretical background is given concerning lean philosophy, supplier collaboration and performance management, and supplier development. In chapter five the research methodology with the research perspectives and data collection are described. Also, the interview script used in this study is presented. The interview script can be found in the appendix.

Chapter six concentrates on describing the empirical outcomes by presenting the conducted interviews of case companies A, B, C and D. In this chapter six is represented how the case companies practice supplier relationship management and collaboration with their suppliers. Also, what kind of collaboration tools these companies utilize, how supplier performance management is conducted, and which performance metrics are in use when measuring suppliers' performance. In addition, the case companies' supplier development practices are described, as well as lean philosophy adoption and utilization of lean practices in supply management. In chapter seven the comparisons are conducted and results (i.e. differences between compared companies) of these comparisons are presented. Chapter eight concludes this study: the research questions are replied, discussions relying on the theory and earlier research are adduced. Also, limitations of this study are identified and suggestions for future research are given. In addition, managerial implications for Company A is suggested. And lastly, reliability and validity of this study is considered.

2 LEAN PHILOSOPHY

Lean can be originated from automotive industry player Toyota. Toyota started to follow the JIT -thinking (just-in-time) in their production in 1960s. (Wilson and Roy, 2009). An employee of Toyota Motors, Mr. Taichi Ohno, can be addressed as the “father” of Toyota Production System (TPS) to which lean philosophy is based on. TPS focuses to eliminate waste at every production step as well as minimizing the stocks. Every non-value add activity is considered as waste at the production. TPS also concentrated to reduce throughput times at the production process. JIT can be interpreted as: correct quality part arrives in the right place at the right time. (Helmold, 2011). This is called also as 5R principles which is illustrated in the figure 3 below.

The	right	part	
In the	right	quality	Zero defects
At the	right	time	Now
In the	right	quantity	One part
At	right	place	Here

Figure 3: The 5R principal (Helmold, 2011)

Even though TPS has originated from the automotive industry also any other company in any business sector can adapt the concept and its principles. (Hines and Taylor, 2000, 4; Helmold, 2011)

There exists many different definitions of lean. Word *lean* is used in the various meanings and contexts. Modig & Åhlström (2013, 87) argue that there exists multitude inconsistent definitions of lean and it is essential to understand the content of lean. Every development action is often called as “lean action”, everything is put under lean label. The definition problem is threefold. (1) First: level of abstract varies. I.e. is lean understood as a philosophy and values, or as a production and/or quality system, or as a tool for eliminating waste. (2) The second problem is concentrating only on levers (e.g. copying tricks from Toyota) instead of understanding the goal. Concentrating on the levers narrows the way to achieve the target. (3) The third problem is related to giving “lean label” everything which is good. It

is crucial to understand which objectives should be achieved utilizing lean and which should not. It is a question of choice making. (Modig & Åhlström, 2013, 87-97)

2.1 Lean Manufacturing / Lean Management system

Lean is based on JIT and TPS but the term *Lean manufacturing* (LM) was invented by MIT (Massachusetts Institute of Technology) researcher John Krafcik in the late 1980's (Charron et al., 2015, 59). Charron, Harrington, Voehl and Wiggin (2015, 65-69) introduce a comprehensive model of lean management system, so called "House of lean management". The house consists different elements and subsystems. Figure 4 illustrated the lean house elements. Four subsystems belonging to the roof structure are: quality management system, socio-technical system, change management system and educational system. These are fundamental for an effective adoption of lean management system.

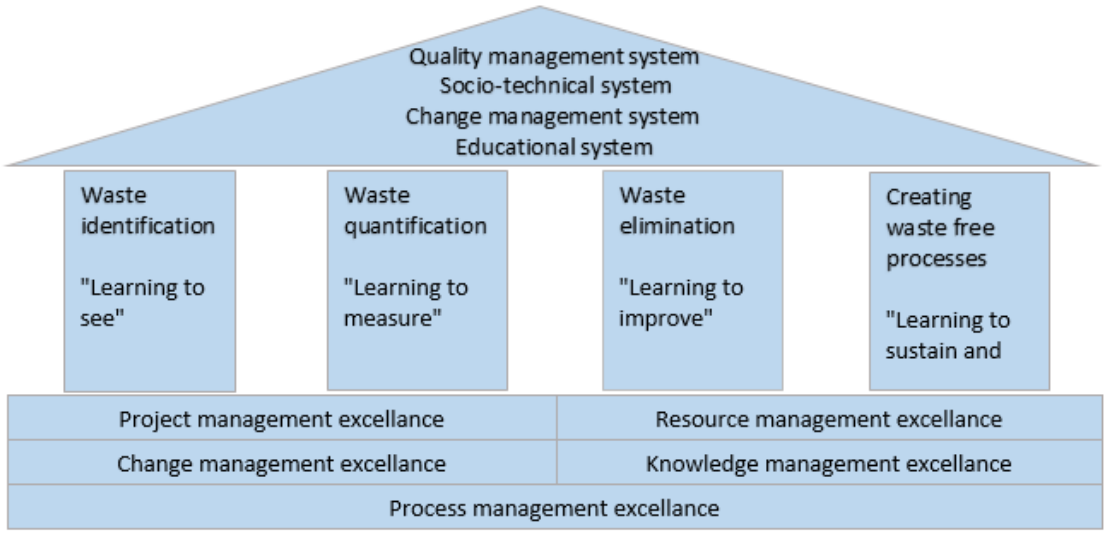

Figure 4: House of lean management (Charron et al., 2015, 68)

The four pillars of the house of lean management illustrate the importance to identify, quantify and eliminate waste in order to achieve waste free processes. Continuous improvement (i.e. kaizen) is essential for a company when adopting lean culture. The foundation of the house emphasizes the organization's resource, knowledge and project capabilities. The ability to implement changes in an organization is crucial for continuous improvement execution. The organization should be process orientated: process management excellence being on the bottom means that the rest of the house is leaning on that. (Charron et al., 2015, 65-69)

2.2 Lean principles and tools

According to Hines and Taylor (2000, 4) the five (5) lean principles are the following: first (1) the company has to identify the actions and the parts of the processes which add value or do not add any value to the customer. Secondly (2) the company should map the points and steps which are required in manufacturing the product. This is called value steam mapping (VSM). Value stream mapping means mapping all the process steps and identifying value add and non-value add activities when the process proceeds (Myerson, 2015, 117). This is very a valuable and eye-opening method to reveal the waste (non-value adding activities) in the current process. The third (3) point is to illustrate the ideal process, meaning only the steps that add value, leaving out cell of waste (such as e.g. scrap and waiting). The fourth (4) principle is to produce only what the customer wants (meaning e.g. no extra added features to the products which the customer does not actually want and is not willing to pay). The fifth (5) principle is continuous improvement. This means trying to achieve better ways of working and when identifying waste eliminate those immediately. (Hines and Taylor, 2000, 4)

Goldsby and García-Dastugue (2014, 222-223) introduce the six most prevailing lean principles and related tool and practices. These principles are (1) reduction of waste, (2) just-in-time, (3) jidoka, which means unveiling the problems, (4) first-time quality, (5) continuous improvement, and (6) people respecting. In the following table (Table 1) are listed the lean practices and tools related to these above mentioned principles.

Table 1: The six most prevailing lean principles and related tool and practices (Goldsby and García-Dastugue, 2014, 223)

Principle	**Practices and tools**
REDUCTION OF WASTE	Problem solving, value stream mapping, genchi genbutsu (go to where work is done, go and see), five why's (asking five times "Why?" to identify the root cause of defects)
JUST-IN-TIME	Kanban, pull system, one piece/continuous flow, rapid changeover
JIDOKA	5S, visual tools, poka yoke (error proofing), andon (highlight and study the problem)
FIRST-TIME QUALITY	Stable and standardized processes
CONTINUOUS IMPROVEMENT	Kaizen (waste identification and improvement actions from everybody), discipline (avoiding the self-satisfaction and targeting to perfection)
PEOPLE RESPECTING	Teamwork, training and learning, safety, shared rewards

Eliminating waste in a supply chain is fundamental thinking behind lean (Goldsby and García-Dastugue, 2014, 222). Waste elimination concerns both inside a company as well as between parties on supply chain (Hines and Taylor, 2000). Value stream mapping reveals the pitfalls and of the process and enables continuous improvement (Myerson, 2015, 96-97).

Charron et al. (2015, 65) argue that there are three different features which are common to every business and these are the main sources causing the problems: Waste, instability and variability. When willing to adapt the lean philosophy and lean thinking, it is crucial to understand the nature of waste. Waste and eliminating the waste is one of the cornerstones of Lean philosophy. Waste can be defined as an activity which does not create any value from the customer point of view. (Myerson, 2012, 19). There exists seven different types of waste; these are (1) overproduction, (2) defects, (3) unnecessary inventory, (4) inappropriate processing, (5) excessive transportation, (6) waiting and (7) unnecessary motion (Hines and Taylor, 2000, 9; Goldsby and García-Dastugue, 2014, 222). These non-value creating activities for customer and only resource consuming activities are called *muda* in Japanese. Also, according to lean the elimination of *mura* and *muri* are essential. The need to expedite or to wait for the next phase in the operations is characteristic for

mura. Muri means overstraining the equipment or the personnel. (Goldsby and García-Dastugue, 2014, 222).

Charron et al. (2015, 189,191) identify two additional cells of waste. They are underutilized employees and behavioural waste. On the other hand, Myerson (2012, 25) does not separate those two but understands those as a one type of waste. From product or service point of view the waste is a non-value adding activity. Originally Mr. Shigeo Shingo (employee for Toyota Motors) was determining the *waste* and different natures of waste for Toyota Production System. (Hines and Taylor, 2000, 19)

Not all non-value adding activities are unnecessary. Hines and Taylor argue (2000, 10) that activities can be categorised to three different categories: first (1) being activity which add value, meaning the activities which are appreciated by the customer. Second category (2) being activity which does not add any value and therefore should be eliminated. This category consists the waste characteristics listed on previous chapter a bow (seven type of waste). The third (3) category of activity includes the activities which do not add any value from the customer point of view but are still needed and necessary for the process.

To identify the waste, the processes should be transparent (waste can be also hidden). Waste is not adding any value on customer perspective and this must be erased. Helmold (2011) argues that the process transparency is the only way to identify problems and all possible sources (root causes) of waste. This leads to continuous improvement.

2.3 Lean thinking and supply chain management

Traditionally lean principles and tools concentrate on manufacturing processes and activities. In order to expand the utilization of the lean philosophy Womack and Jones (1996) presented the lean thinking concept. Lean thinking comprises the parties belonging to the same supply chain and suggests the company to consider the five following points in order to gain benefits originated from lean philosophy: (1) customer value determination, (2) value stream mapping, (3) execution of actions to evoke value to flow, (4) transferring the supply chain to pull mode, and (5) endeavour to perfection via continuous improvement.

Lean supply chain management applies lean philosophy to the business relationship between the parties of the supply chain. The lean thinking is not only making material and information to flow smoothly but moreover concentrating on growing the revenue,

profitability and efficiency of assets', and to reduce inventories, costs and working capital. (Goldsby and García-Dastugue, 2014, 228-229). Interfaces between supply chain parties (customers, key suppliers) need to be rigorously managed in order to reveal waste in the supply chain and to avoid inefficient processes. (Goldsby and García-Dastugue, 2014, 223)

To gain competitive advantage and full benefits the lean methods are providing, it is crucial to implement lean thinking also externally. Following the lean principles only in own manufacturing function is not enough for achieving competitive advantages. (Drohomeretski et al., 2012). Lean manufacturing needs to be aligned with the supply chain, both upstream and downstream (i.e. lean supply chain management, LSCM). By doing this adaption of LSCM competitiveness increases in the entire supply chain.

If a company is not implementing lean thinking concerning comprehensively the whole chain, identified waste could be transferred to another party in the supply chain in order to "lean" company's own internal processes. As an example if a company reduces the component inventory value on the balance sheet by transferring the responsibility for component inventory to its supplier may cause more waste (i.e. increased costs) in the whole supply chain. This creates more waste and bigger inefficiency in the supply chain. Eventually costs of the supply chain will end up to the customer to pay. So, eventually when one party on the supply chain is sub-optimizing its own internal processes (instead of concentrating on fixing the root causes of the problem and following consistently the continuous improvement process) the outcome is that the entire supply chain is not "leaner" and has lost some of its competitiveness against other supply chains. (Goldsby and García-Dastugue, 2014, 223-224)

Hines and Taylor (2000, 5) present a pattern consisting the objectives and methods which are required from a company when a company is willing to start following lean philosophy. These objectives and methods are illustrated in the figure 5.

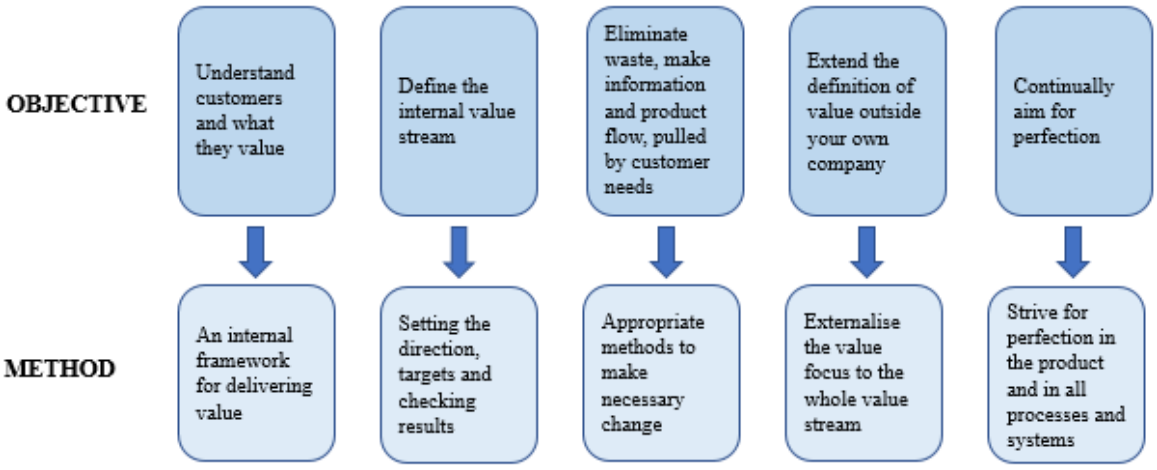

Figure 5: Objectives and methods for going lean (Hines and Taylor, 2000, 5)

Goldsby and García-Dastugue (2014, 224) emphasize that a company's management has a crucial role when establishing lean thinking in the company. Also, as the figure above (Figure 5; objective and method for going lean) illustrates, lean thinking, the culture of identifying and eliminating waste should be extended outside of the focal company to its key suppliers and also to its customers.

Additional forms of waste identified in supply chain (in addition to the wastes described on the charter 2.1.1) are due to misalignment of a company's internal business processes (i.e. targets of company's functions are conflicting) or processes with suppliers or customers. This leads to failed business opportunities and inefficiencies generating hidden cost. According to Goldsby and García-Dastugue (2014, 231-237) the forms of supply chain wastes are: using inaccurate cost information for decision making, missed business opportunities; over-promising; inaccurate expectations in relationships; late perception; misalignment incentives between supply chain partners internally and externally (unfair rewarding); generating excessive product variances. For instance, over-promising can lead to waiting, hurried operations and overburdening (muda, mura, muri) which are the traditionally identified form of wastes in lean philosophy of operations.

Characteristics for effective and powerful SCM are e.g. strong and tight supplier relationships, flexibility, seamless information flow (effects to lower inventory levels, elimination uncertainties), outsourcing non-core activities, on demand pull system (effects to cost and inventory reduction) (Chandra and Kumar, 2000). There are numerous benefits that a company and a supply chain can achieve when LSCM is adapted, i.e. aligning LM

and SCM. These benefits are e.g. improved value delivery to customers, waste elimination (also elimination of non-value add activities) in various phases in the chain, effective information management and collaboration between supply chain partners, to mention some of those. These lead to cost reduction and increase flexibility in the chain. A company can also reduce supplier base and concentrate on developing selected suppliers. (Drohomeretski et al., 2012)

Employee training plays a significant role when a company starts to apply more effective SCM. According to the lean philosophy team working practices are crucial when adapting new thinking and the way of working. Team work is needed for effective problem solving and the knowledge sharing. This leads to continuous improvement and elimination of waste. (Drohomeretski et al., 2012)

Drohomeretski et al. (2012) proposed a framework for LSCM in their study. By studying and analysing the literature researchers LSCM's key practices and performance measurements were identified. In the next table (Table 2) is illustrated five key SCM processes having direct link to lean. These are: (1) Demand management, (2) Management of customer service, (3) Supply, (4) Product development and (5) Production flow management. LSCM practices related to the certain key processes were listed as well as related performance measurement. Every LSCM practice was coded to be able to illustrate the framework (figure 4) distinctly. (Drohomeretski, 2012)

Table 2: LSCM: practices and performance measures (Drohomeretski et al., 2012)

Key processes	Practices LSCM	Code of Practice	Measure Performance
Demand Management	EDI (Eletronic Data Interchange)	DM1	Service Level
	Productive capacity synchronized in the chain	DM2	Shift in demand forecasting
			Load Factor Capacity Chain
Management of Customer Service	Value Identification	MCS1	Evaluation of the Relationship (client)
	Consumer Responsiveness	MCS2	Fidelity Index
Supply	Limited number of suppliers	SUP1	Evaluation of the Relationship (supplier)
	Suppliers near	SUP2	Delay in Delivery Index
			Defective Product Index
	Transparency in costs	SUP3	Deliveries Index with incorrect amount
	Resourcing	SUP4	Average Price
Product Development	Integrated development of products and services	PD1	Product Launch Time
	Integrated innovation	PD2	Number of Products Launched
Production Flow Management	VSM (value stream map)	PFM1	Stop Time Line
	Kaizen	PFM2	Tackt Time
	Kanban delivery	PFM3	Inventory Turnover
			Cost of Transportation
	Milk Run	PFM4	Return to Index
	Just Sequence	PFM5	Emergency Deliveries Index

The proposed framework for LSCM is illustrated in figure 6. The framework consists six competitive priorities which are (1) quality, (2) cost, (3) reliability, (4) speed, (5) flexibility and (6) innovation. As can be seen on the figure 6 LSCM practices belonging to the supply key process (code of practices: SUP1, SUP2, SUP3, SUP4) have influence to every competitive priority. The corporate strategy is influenced by customer requirements as well as action of competing chains. The integrated quality (i.e. continuous improvement, problem solving) and cultural change are the basics of the LSCM practices implementation. (Drohomeretski et al., 2012)

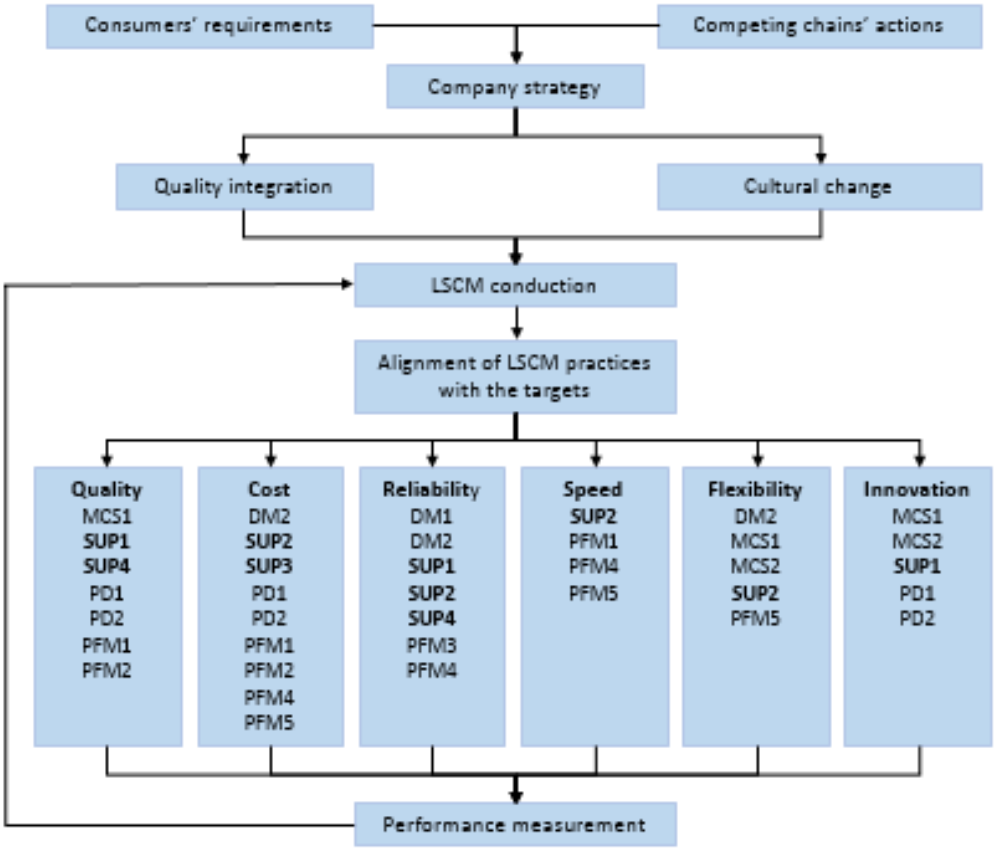

Figure 6: Framework of LSCM (Drohomeretski et al., 2012)

2.3.1 Upstream lean supply chain management

Companies are concentrating more and more on one's core competencies. This means that outsourcing activities are increasing and playing on the global market field is reality to many companies. Due to heavy outsourcing activities, a company can face multitude problems and complexity in the product development and when launching the products. (Helmold, 2011). Even though many companies are following lean philosophy and principles in their own production and facilities, many of them have not integrated their suppliers to "the lean chain" and are not applying the lean concept toward suppliers. For the company success, it is important that upstream supply chain (USCM, value chain toward suppliers) is streamlined and managed following lean principles (meaning that activities and processes should be lean). A company cannot achieve the full potential and success offered by lean if lean principles are not implemented throughout the whole chain, leaving suppliers out. Helmold (2011) argues that a company can gain benefits and cost savings if it integrates lean to its supply chain and starts to eliminate the waste according to the lean principles.

When introducing and deploying lean philosophy and lean thinking to the suppliers, five parameters (or variables) come into a question. Illustrated in a figure 7 below these are pull system, continuous flow, high inventory turnover, short lead time and level production. (Wu, 2003; Drohomeretski et al., 2012)

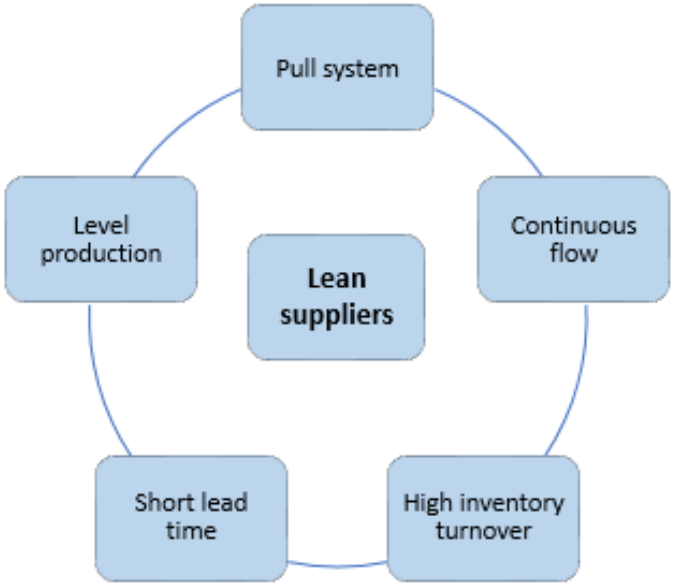

Figure 7: Variables lean suppliers (Wu, 2003)

For achieving an optimal USCM a company should follow four principles illustrated on the following figure (figure 8). These principles, or pillars of lean production system, are the flow, tact, pull and zero defect. (Helmold, 2011). Rolling-out and implementing these principles to the suppliers are the most important tasks of the company's supplier relationship management. These start to add value to the activities and both parties gain advantages (such as the cost savings). Focusing on the value adding activities, main issues and improving communication with the suppliers (between parties) require lean competencies, flat hierarchies and direct input. This may require several development steps such as establishing the core function competencies and responsibilities, integrating suppliers, establishing flat hierarchies and starting the continuous improvement activities and follow up.

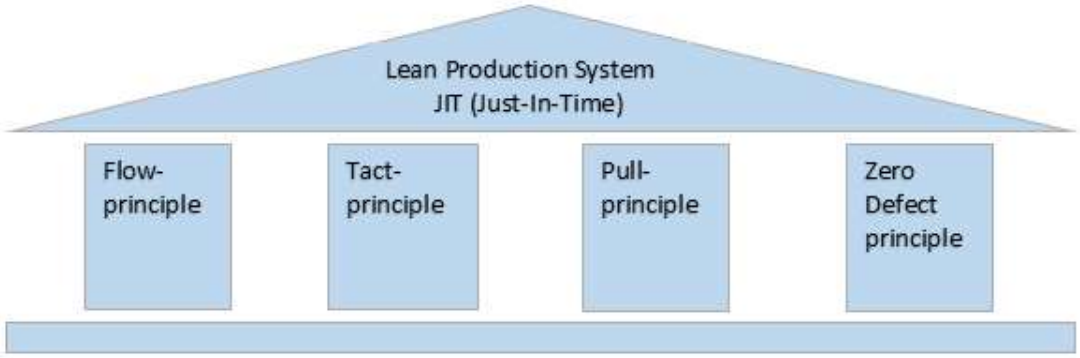

Figure 8: The four pillars of JIT (Helmold, 2011)

Looking at the LSCM framework proposed by Drohomeretski et al. (2012, 8-9) and taking up only the LSCM practices which are related to the supply key process, in the table below (Table 3) can be seen four practised which have direct integrations to lean and which belong under the PSM responsibility.

Table 3: LSCM practices and performance measures of the supply key process (Drohomeretski et al., 2012)

Key processes	Practices LSCM	Code of Practice	Measure Performance
Supply	Limited number of suppliers	SUP1	Evaluation of the Relationship (supplier)
	Suppliers near	SUP2	Delay in Delivery Index
			Defective Product Index
	Transparency in costs	SUP3	Deliveries Index with incorrect amount
	Resourcing	SUP4	Average Price

Extended value steam mapping could be used when identifying the opportunities for an improvement on processes between a company and its supplier. Goldsby and García-Dastugue (2014, 224-225) suggest that a company should utilize a relationship-based map for identifying the suppliers having the greatest potential for value adding, waste elimination and cost reduction. When a potential supplier is selected a company should map the value stream together with the supplier. Conducting an extended value stream map together will expose the sources of waste, non-value adding activities and opportunities for improvement. Also, at the same time mutual trust and commitment increase. (Goldsby and García-Dastugue, 2014, 222-228).

The most prevailing lean principles, related tool and practices are described in the chapter 2.1. The utilization of these in supplier relationship management is illustrated on the table below (Table 4). According to Goldsby and García-Dastugue (2014, 230) lean practices which are applicable for supplier relationship management are value stream mapping, five why's, Kanban, stable and standard process, kaizen and shared rewards.

Table 4: Lean principles and related tool and practices for supplier relationship management process (Goldsby and García-Dastugue, 2014, 230)

Principle	**Practices and tools**
REDUCTION OF WASTE	Value stream mapping, five why's
JUST-IN-TIME	Kanban
JIDOKA (MAKE PROBLEMS VISIBLE)	-
FIRST-TIME QUALITY	Stable and standardized processes
CONTINUOUS IMPROVEMENT	Kaizen
PEOPLE RESPECTING	Shared rewards

The researcher sees that also lean principle Jidoka (make problems visible) can be utilized in supplier relationship management. For instance, late perception is a form of waste appearing in supply management. This means for example changes in demand, availability or quality levels. If a company is utilizing Jidoka –principle and making problems occurring in supply chain, the visible waste could be avoided. Visibility and communication are in the key role for enabling the effective lean supply management. Inventory levels, availability situation, demand changes and quality levels should be visible for both parties; for a company and its supplier.

3 SUPPLIER COLLABORATION AND PERFORMANCE MANAGEMENT

Horvath (2001) emphasizes the importance of collaboration in supply chain management. Due to accelerated speed on markets and changing business environment the efficient collaboration between value chain business partners is the key enabler for providing the competitive edge. Likewise, Nix and Zacharia (2014) state that uncertainty and competition in business environment have increased and in the network economy the abilities, expertise and know-how are scattered. Since companies are concentrating more on core-competencies, they are more dependent on their suppliers' resources and capabilities (Sahay, 2003). This increases the importance of collaboration and close relationships between business partners. The supply chain has to be agile and alert to react fast if the business environment changes. Also, Kähkönen et al. (2017) argue that in many companies the supply management function has received an acknowledgement as being a strategically significant function of a company. This acknowledgement has increased the performance of the function even more. Collaboration is a component leading to better supplier performance and eventually influencing the company's outcome. (Kähkönen et al., 2017).

Dyer and Hatch (2004) argue that the source for competitive advantage of a company (and its business partners) is to collaborate, share information and knowledge with its suppliers. Also, Sahay (2003) enhances the role of collaboration in value creation and states that collaboration is the key to success for players in the chain. Co-operation, interaction and close relationships enable the decision making which considers all the influencing aspects. In addition, Horvath (2001) states that collaboration is the driving force when optimizing the operations in the value chain. Supplier collaboration level is influenced by for instance mutual trust, supplier status (i.e. strategically important supplier), supplier development actions and business planning (Kähkönen et al., 2017).

Advantages that efficient collaboration with the suppliers is providing for a company are for instance lower inventory levels, improvements on quality levels, faster product development processes and improved delivery accuracy (Corbett et al. 1999). Also, Corsten and Felde (2005) found out in their research that collaborating with suppliers affects positively to a company's performance by increasing inventive capability and also financial outcome improves. In addition, component availability will improve due to better capability of suppliers to plan their capacity utilization and production. Increased component availability

leads to better capacity utilization in the company's manufacturing too. (Sahay, 2003). On the other hand, if collaboration fails between a company and its supplier the consequences are reverse: information misalignment leads to Forrester effect (bullwhip), inventory levels can increase and a delivery problem can occur. In addition, delays can appear in product development projects and eventually lame collaboration can lead to loss of profit. (Lee et al., 1997)

3.1 Supplier collaboration elements and tools

Simatupang and Sridharan (2002) define collaboration with suppliers as external vertical collaboration. Yet, internal collaboration must be tightly connected with the supplier collaboration in order to be able to integrate processes, to share information and to develop trustworthy relationship between business partners, a supplier and a company. Barratt (2004) argues that collaboration is more than just an operational level information exchange concerning activities. It should be executed also on strategic and tactical levels in the supplier's and the company's organizations. External vertical collaboration with suppliers include aspects such as supplier relationship management related collaboration (such as supplier development and performance related topics), information sharing within product development projects and information related to a forecast (demand information). (Barratt, 2004)

Barratt (2004) illustrates that a collaborative culture of a supply chain includes elements such as trust, mutuality, information exchange, and communication and openness. According to Ellram and Edis (1996) mutuality means that both business partners (a supplier and a company) should gain benefits when collaborating and changing information. Information exchange is essential for performance improvement. Information should be transparent, accurate and real-time. This is achieved by having a common system for information sharing which also enables joint product development actions (Christopher and Towill, 2000). A supplier and a company should have broad interfaces, communication contacts, on different levels of organization and between the functions. Communication should have several channels instead of a single point of contact. Openness is basis for trust and commitment. (Barrett, 2004) .Trust and commitment are discussed in the next chapter 3.2.

Horvath (2001) lists eight points of the features the collaboration technology should obtain in order for a company to conduct collaboration and share information efficiently in different

levels on the network. (1) Technology used should be easy to access with no- or low-cost for a company's business partners. This refers to browser-based application. (2) Also, infrastructure should have capabilities for massive data storage from various sources. (3) Moreover, application integration should be possible and (4) collaborative technology should be user friendly, meaning easy to learn and to use. (5) In addition, a system should have business intelligence features such as ability to analyze information. This enables continuous improvement actions and learning while the process is ongoing. (6) Collaboration solution should offer capability for interaction between parties in the chain and for exchanging efficiently information related to activities (such as for example collaboration in product development processes, demand and supply planning, operations) on the chain. (7) Furthermore, while information changing is tremendous in the collaboration and information is sensitive on the nature it is critical that assuring security capabilities are on high level. (8) And lastly, capabilities for electronic commerce. If a company is conducting collaboration with an e-business network that has before mentioned features of collaboration technology, this offers to the company the competitive advantage on the markets where competition is growing with increasing pace (Horvath, 2001).

3.2 Trust and commitment

Trust and commitment from both parties, i.e. a supplier and a company, influence the level of the collaboration. In turn, Barratt (2004) argues that one obstacle hindering valuable collaboration between business parties is lack of trust. Acts that benefit both parties creates trust between parties and trust leads to commitment. (Lambert et al., 2014, 249). Concerted endeavor, which is beneficial for both parties, toward continuous improvement should be rewarded fairly between a company and its supplier. This approach provokes trust and commitment and deepens the relationship toward robust collaboration. The solid and trustworthy relationship enables joint innovations which benefit both parties on a long-term and create competitive advantages on the markets. Also, opportunistic behavior in the relationship is avoided if the level of trust and collaboration are on solid level and the business partners are mutually committed to the relationship. (Goldsby and García-Dastugue, 2014, 228).

Lambert et al. (2014, 249) argue that the level of trust and commitment is influenced by the position of the parties. This means that if both parties are confident that the business relationship is beneficial for both the higher is the level of the trust and commitment. Also,

if individual company's position in the markets is respected and valued, this creates trust toward business partners. Relationships where occurs little disagreements and contradictions have higher level of trust. Likewise, the level of trust is influenced by the level of communication: better, tight communication leads to higher level of trust and commitment. Managers of both parties are in a key role when creating trust in business relationship.

3.3 Early involvement

One advantage efficient collaboration offers is the faster product development process (Corbett et al. 1999), as mentioned earlier. In addition to speed, suppliers can offer innovative ideas if they are involved early in the product development project. Collaboration and information sharing concerning product development process denotes to sharing and modification of the design document (e.g. drawings). This contributes to prompt product development process and faster market release of the new product. (Sahay, 2003)

Dowlatshahi (1998, 1999) states that early supplier involvement (ESI) is beneficial for a company. Although, some pre-requisites and recommendations should be considered in order to be successful in ESI concept. Top management support is essential in order to be able to make decisions concerning the strategic material development and product design. In addition, a company should have a functioning set-up for the ESI concept. This means that the resources are in place (involvement needed from product design, sourcing/procurement, manufacturing and a supplier) and the responsibilities are clear. Communication and collaboration should be transparent, prompt and responsive with quick reactions. The ESI concept should be utilized with strategic suppliers. Business relationship with a supplier should be a tight, long-term relationship with high level of commitment and trust. (Dowlatshahi, 1998; Dowlatshahi, 1999). In addition, Dowlatshahi (1999) states that if the ESI concept is conducted efficiently, considering the pre-requisites, a company can gain cost savings and be able to create innovations with its strategic supplier.

3.4 Lean supplier collaboration

Goldsby and García-Dastugue (2014, 225) argue that when selecting suppliers for initial starting point for lean thinking implementation and collaboration actions a company should select the most critical strategic suppliers since they are the most beneficial for the company: bringing the greatest improvement value. Although, the continuous improvement practices should be implemented with all suppliers.

The researcher argues that information sharing internally with a company's functions as well as externally with a company's supply chain parties has a crucial role when preventing supply chain wastes to occur. Forecast and demand information sharing hinders overproduction, shortages and excess inventory. When the problems are visible (Jidoka) this enables fast reaction with efficient collaboration methods and corrective actions in the supply chain avoiding wastes to realize.

When a company is adapting lean thinking and principles with its supplier and when having mutual trust and commitment the more beneficial the relationship is to the both parties. Open and honest collaboration with adopted continuous improvement philosophy is a key to create superior value. (Goldsby and García-Dastugue, 2014, 224)

3.5 Performance management

Krause and Ellram (1997a, 1997b) state that regular well-formed supplier performance evaluation procedure is needed to follow-up and control the supplier's performance development. Handfield et al. (2000) argue that supplier development actions can influence "*to such areas as quality increase, better delivery performance, product innovation, total cost, and cycle time*".

Supplier performance should be evaluated and measured in order to identify the areas which could need more development actions and should be concentrated on. Measured areas such as delivery performance related (lead time, delivery accuracy), quality related (i.e. delivering the agreed quality level products, dppm i.e. defective parts per million), cost related (i.e. cost reduction targets), process related (e.g. efficiency e.g. when implementing the engineering/design changes or in RFQ process), technology/R&D related (e.g. capability to adapt new technologies, having innovative technology), and relationship

related (level of relationship). (Krause, 1997) Table 5 below lists areas that are measured and the nature of metrics.

Table 5: Areas to measure and the nature of metrics (Krause, 1997)

Measured area	**Nature of metrics**
delivery performance related	lead time, delivery accuracy
quality related	delivering the agreed quality
cost related	competitiveness
process related	efficiency
Technology/R&D related	capability, innovativeness
relationship related	level of relationship

Wagner (2006) argues that the companies should execute a consistent formal and regular supplier performance management and evaluation (i.e. cost, delivery, quality, technology) practices, set performance targets to the suppliers and implement a constant, robust communication with the suppliers about the targets and the company's goals. Also, direct supplier development actions should be planned and monitored. With this approach, a company can achieve competitive advantage on the markets and suppliers will become a strategic asset to a company. Performance management and evaluation is discussed more in chapter 4.1 (Supplier development practices and activities).

4 SUPPLIER DEVELOPMENT

Quality requirements are increasing; desired quality level of products is rising constantly. Technology changes and development happen more quickly than before; globalization and IoT (i.e. internet of things) affect the accumulating pace. Product life cycles are shorter than before influenced by the new requirements, fast development and increasing competition on markets. Also, price competition is tough; competitors are having cost-cut actions in order to appeal more customers and to gain more market share. (Routroy and Pradhan, 2013).

All these before mentioned points have influenced companies to find out new strategic approaches to play on markets successfully. To maintain the status in competition a company has to pay attention to the supplier network. Purchasing must secure and develop the network of capable and competent suppliers for the company. While the company itself is concentrating on core competencies suppliers must support the business performing better than the competitors' suppliers. (Krause, 1997). This means that supplier development has become a part of a company's strategic approach and operations. (Routroy and Pradhan, 2013). Since supplier development has become to have a strategic role when companies are concentrating more on core competencies and outsourcing other activities, this has increased the expectations toward suppliers and the company's purchasing personnel performance. The cost of a product should be competitive, the quality level should be high, and products should be delivered with timely manner. (Handfield et al., 2000)..

Krause et al. (1998) and Handfield et al. (2000) point out it their researches that companies have three alternative approaches if the supplier performance is not at the appropriate, agreed level. A company can (1) insource products if the company has capability to produce the products, (2) switch the supplier to another (i.e. find an alternative source) or (3) start the supplier development activities with the supplier in order to improve the performance and capabilities of the supplier. Wagner (2006) defines the insource option as vertical integration, i.e. to include also the alternative to acquire the supplier in addition to own production. Routroy and Pradhan (2013) add one more option to these alternative procedures, i.e. the combination of the before mentioned three alternative approaches.

Which approach to use if the supplier is not performing acceptably and on the agreed level, depends on various reasons. Switching the supplier from one to another could be difficult and even impossible if a considerable alternative supplier does not exist or if the switching cost rise too high. Technology performed by the current supplier could be exceptional and even owned by the supplier. In this case, proceeding with supplier development actions would be the best option. (Wagner, 2006). On the other hand, if the supplier is not classified as strategically critical and alternative suppliers exist, switching would be reasonable and more cost-effective than starting development actions with the poorly performing current supplier (Handfield et al., 2000). If the company considers the vertical integration approach, thorough monitoring concerning the company's core competencies versus strategy should be conducted. Manufacturing processes which do not belong to the core competencies should not be taken in-house. Hence, in-source option would require extensive investments. (Wagner, 2006). However, Handfield et al. (2000) argue that if a product or technology provided by a poorly performing supplier is strategically important and brings competitive advantage in the future business markets a company should consider to bring manufacturing in-house with supplier acquisition.

Leenders (1966) first defined the concept: supplier development. According to Leenders (1966) supplier development consists of actions which a company performs in order to aim to increase the sufficient suppliers and to improve the performance and outputs of these suppliers. Krause's (1997) definition for supplier development is following: "Any effort of a firm to increase performance and/or capabilities to meet the firm's short- and/or long-term supply needs." Krause and Ellram (1997a, 1997b) added to this definition the aspect of collaboration, i.e. that the development actions and efforts should be conducted together with the supplier. Handfield et al. (2000) brought a strategy aspect to the definition of supplier development. They emphasize that supplier development should be considered as a long-term business strategy which is a foundation and a starting point when aiming to the genuinely integrated supply chain.

4.1 Supplier development practices and activities

Krause (1997) defines supplier development activities to consist of various levels of actions and efforts. Limited efforts are targets on product (or service) performance on short-term perspective. As the examples of limited efforts can be mentioned performance improvement request toward supplier and unofficial supplier evaluation. Extensive efforts (e.g. training

supplier, investing supplier's manufacturing process) mean that a company is consistently targeting an achieving long-term competitive advantages by developing supplier capabilities. In the following table (Table 6) are listed, on order of importance, the supplier development activities resulted from Krause's (1997) research.

Table 6: Supplier development activities on priority order. (Krause, 1997)

no.	Supplier development activity
1	Providing supplier evaluation results and feedback to the supplier
2	Inviting the supplier to a factory visit to introduce manufacturing process step where the supplier's supplying product is used
3	Visiting the supplier factory to endorse supplier performance
4	Requesting the supplier to improve its performance
5	Promising future business opportunities as a result of performance increase
6	Formal, official supplier performance evaluation process
7	Dual/parallel sourcing (using 2 to 3 suppliers) in order to create competition
8	Informal, unofficial supplier performance evaluation (i.e. ad-hoc performance assessment)
9	Promising present business opportunities (i.e. volume increase of purchased item)
10	In order to eliminate incoming quality inspection, utilizing supplier quality certification procedure
11	Awarding the well performing supplier
12	Offering and arranging training to the supplier's staff
13	Multiple sourcing (using 4 or more suppliers) in order to create competition
14	Investing in the supplier's operations and manufacturing

Krause and Ellram (1997a) argue that supplier development activities alter between strategic and corrective actions. Where the strategic being systematic actions toward improvement of suppliers' capabilities and the corrective actions being for instance, training offers for suppliers in order to gain process improvements.

Supplier development activities can be divided into two dimensions, namely direct and indirect activities. Direct activities have two factors: (1) human resource related and (2) capital resource related. Indirect activities consist of four segregated elements. These are

(1) occasional performance management, (2) regular performance management, (3) performance evaluation process, and (4) communication. (Wagner, 2006). Following figure (Figure 9) illustrates the supplier development factors divided into two dimensions.

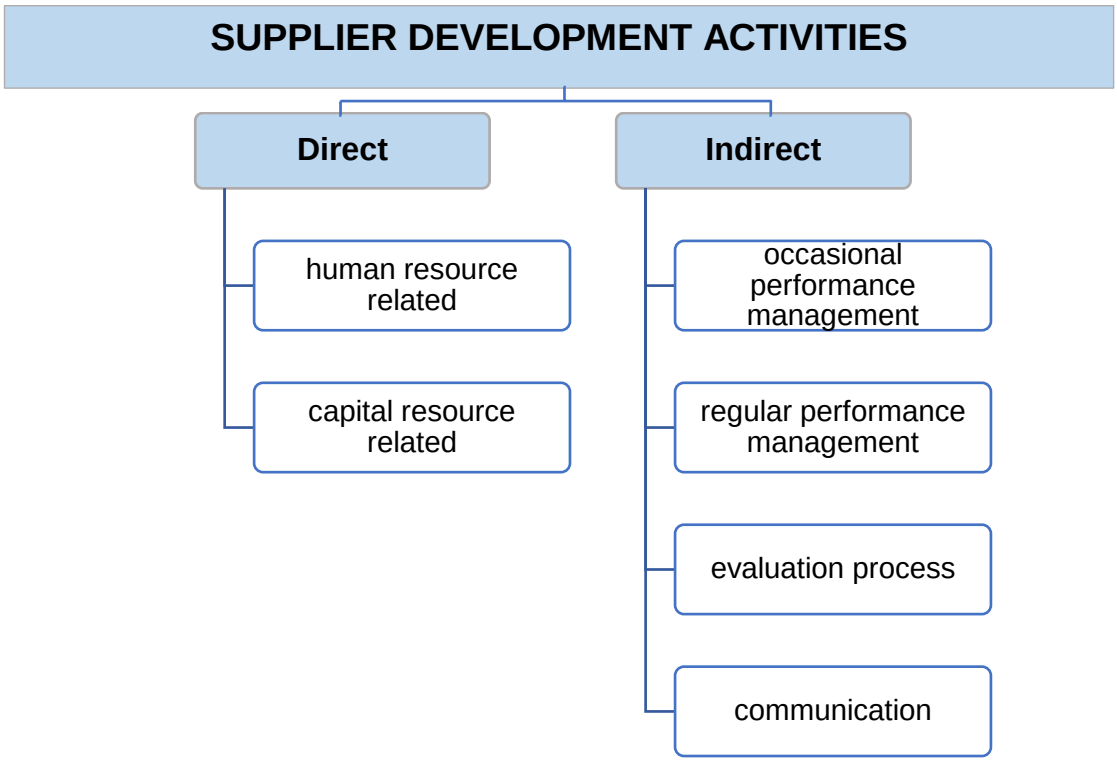

Figure 9: Direct and indirect supplier development activities (Wagner, 2006)

Human resource related development actions include components such as offering process or strategic advice to the supplier (e.g. related to quality management), knowledge transfer, expertise and personnel transfer. Capital resource related direct supplier development actions are defined as offering financial support or investing directly to the supplier's operation (e.g. tooling). Occasional performance management indicates that a company does not have stabilized procedure for monitoring and to follow-up the suppliers. Occasional performance management can be named as reactive performance monitoring while a company observes the supplier's execution not until some problems related to supplier's output (e.g. fail delivery on timing wise or on quality level) occur. Regular performance management implies real-time, proactive monitoring where a company is aware of the status of the suppliers' operations and is tracking the performance and output in real time. Measured activities belonging to both reactive and proactive performance management are

related to cost and savings targets, delivery performance, product quality and technology. (Wagner, 2006). It is essential to react fast if some hick-ups occur in the supply chain.

Evaluation process refers to an established process which is widely implemented in a company's supply management organization and is executed on following a company's yearly or monthly supply base management process cycle. It is vital for relationship development that results are communicated to the suppliers. The indirect activity communication designates communicating the company's strategic targets to its suppliers and also executing supplier recognition and awarding. Also, arranging a supplier day event falls under communication on Wagner's research. (Wagner, 2006)

Wagner's (2006) research results are similar and parallel to Krause's (1997) research findings. Companies are not willing to exploit the capital resource related activities such as direct invests to suppliers' operations. Also transferring staff to the supplier's premises is a rarely used action. Even though direct supplier development activities and investing brings ample and crucial benefits on the long run for company's competitive advantage. (Monczka et al, 1993; Krause 1997; Wagner, 2006). Also, awarding well performing suppliers was not ranked high neither on Krause's (1997) nor on Wagner's (2006) research. Concerning on the relation between indirect and direct supplier development factors, Wagner's (2006) research shows that it is more likely that a company utilizes human resources than capital resources when supporting indirect supplier development activities.

4.2 Supplier development processes

Supplier development actions vary heavily being something between remedial, i.e. concentrating performance improvements within the short term time frame with limited efforts to strategic activity and operation having long term perspective with extensive efforts. (Krause, 1997; Krause and Ellram, 1997a). Krause et al. (1998) define in their research supplier development consisting of both reactive as well as strategic processes. Differences between these two approaches are illustrated in the following figure (Figure 10).

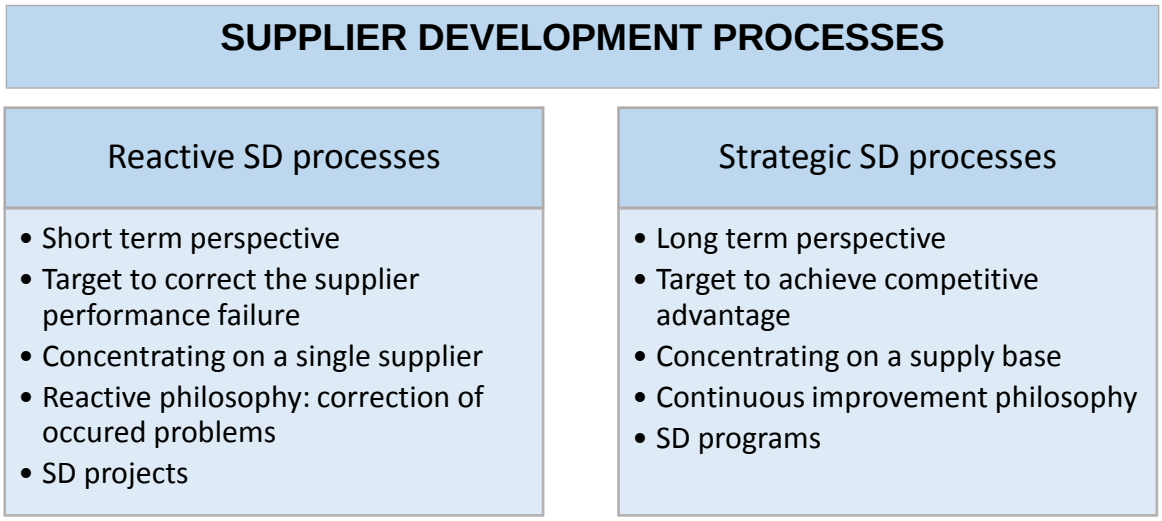

Figure 10: Differences between reactive supplier development processes and strategic supplier development processes (Krause et al., 1998).

The reactive supplier development processes concentrate on the individual supplier performance being driven by a problem. The reactive supplier development process starts when a deviation, a defect or an error is recognized in the supplier performance. A purpose for the reactive SD processes is by executing SD projects to correct the occurred problem on a single supplier's performance. The reactive SD processes are targeting on short term improvements. As the examples of the drivers which start the reactive SD processes can be mentioned poor on-time delivery performance or occurred quality defects. (Krause et al., 1998).

According to Krause et al. (1998) the strategic supplier development processes are concentrating on developing a competitive advantage on a long-term perspective by continuous improvement actions of the supply base. Distinctive for the strategic SD processes are supplier development programs which concentrate on the strategic suppliers selected from a supply base. The starting point for the strategic SD process is not a poor supplier performance but instead the objective is to allocate the development resources and efforts in a way that the best possible benefits can be gained to strengthen the competitive advantage on a long run. As the example of the drivers of the strategic SD processes can be mentioned collaboration, cooperation and integration. This means that the suppliers are integrated into the company's activities having continuous improvement philosophy and the

suppliers are introduced to the product (i.e. early involvement) and technology development projects. (Krause et al., 1998).

4.3 Strategic supplier development: heading toward Lean

Krause et al. (1998) argue that in order to reach the ability to start building a strategic supplier development process a company has to walk a certain path: a reactive supplier development is needed first to identify the poor performers and to either eliminate those suppliers from the supply base or to monitor, guide and follow up suppliers' performance improvement.

Krause et al. (1998) describe in their research the model for strategic supplier development process illustrated in the following figure (Figure 11). The model consists ten different phases: (1) identifying the critical commodities, (2) identifying a strategic supplier, (3) forming the development team, (4) starting the communication with the supplier, (5) identifying development areas in order to achieve competitive advantage, (6) investigating the potential of identified development areas and chances to achieve the development targets, (7) consensus of metrics to be used measuring the performance, (8) starting cooperative development work and implementation the development outcomes with the supplier, (9) recognizing the supplier's accomplishments and rewarding, and (10) establishing continuous improvement process.

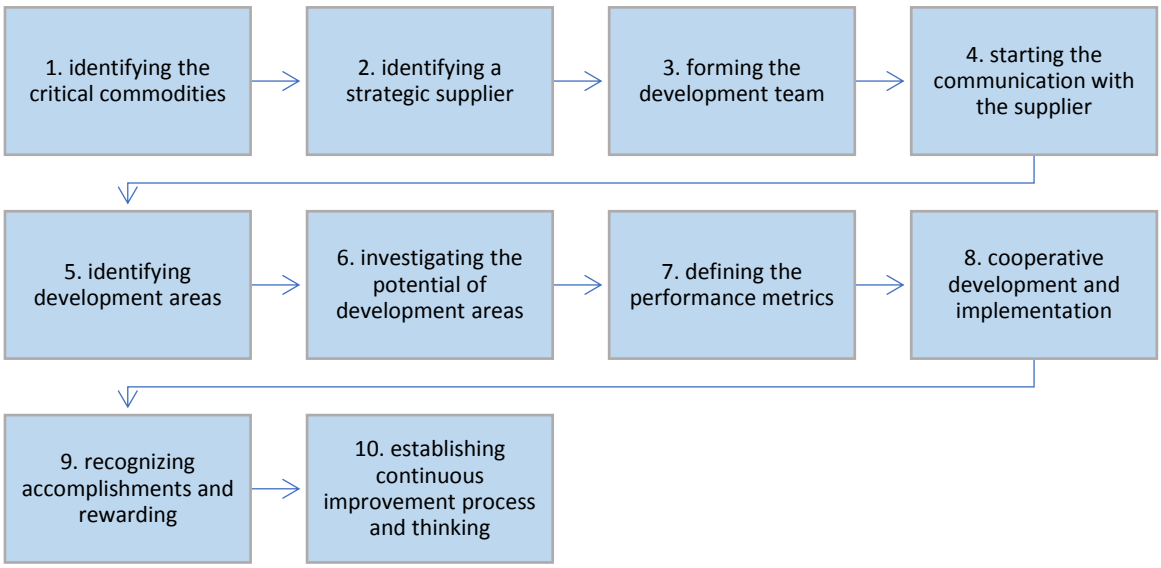

Figure 11: Strategic supplier development process (Krause et al., 1998)

When starting the strategic supplier development actions and identifying the critical commodities for development purposes a company can utilize Kraljic's matrix. Using Kraljic's matrix commodities can be divided into four different categories. Namely, (1) strategic, that is having a big purchase spend and a high supply risk, (2) bottleneck, that is having a low purchase spend but a high supply risk, (3) leverage, that is having a big purchase spend but a low supply risk, and (4) non-critical, having a low supply risk and a low purchase spend. (Kraljic, 1998).

Development areas to be concentrated on should be identified to be critical for improvement. This kind of approach is following lean principles since the target is to continuously improve the actions and processes as well as to eliminate waste namely elimination of non-value add activities. Krause et al. (1998) argue that when comparing strategic and reactive supplier development strategies the process step number five (identifying development areas) reveals the biggest difference between those two strategies. After potential development areas are identified feasibility study is needed to reveal the potential for development. Before starting the cooperative development project with a supplier it is important to mutually agree the metrics to be used when measuring the performance in question of quality, delivery performance, cost, service level, technological and environmental aspects. Also, roles and responsibilities between different parties in the development project should be agreed. After a successful development project implementation a well-performing supplier should receive a recognition and continuous improvement thinking and philosophy should be established between the parties as a normal procedure, everyday way of working. (Krause et al., 1998)

In order to practice lean in supplier development, a company has to identify the nature of the waste occurring in the supplier relationship and point out the different sources of waste. As stated above, establishing continuous improvement is essential when implementing lean practices. Selecting strategic suppliers for supplier development initiatives enables a proactive procedure for executing the strategic supplier development process (Krause et al., 1998) Organizing kaizen events with its strategic suppliers strengthen mutual trust and commitment toward deeper lean adoption. (Handfield et al., 2000).

4.3.1 A process map

In addition to the strategic supplier development process invented by Krause et al. (1998) Handfield et al. (2000) formed in their research the generic process map for the supplier development. The map (in the following figure 12) includes seven steps and the goal of the process map is to help and guide companies to perform and to deploy the supplier development actions and benefit the outcomes. The different process phases are (1) identifying the critical commodities, (2) identifying the critical suppliers, (3) forming a cross-functional team, (4) meeting with supplier management, (5) identifying the key projects, (6) defining the convention details, and (7) monitoring the status and adjusting strategies. (Handfield et al., 2000)

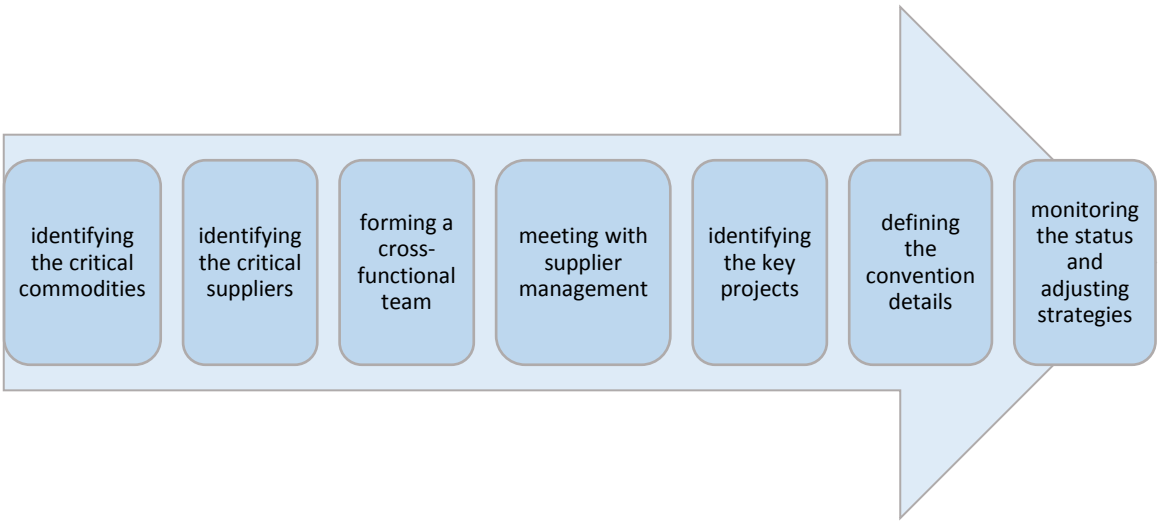

Figure 12: A process map for the supplier development process (Handfield et al., 2000)

Phase one of the process map emphasizes the significance of concentrating on the most critical commodities in the development actions. In phase two is identified the strategic, critical suppliers of the company. This phase is followed by the formation of the cross-functional team. This is important in order to have uniform understanding and enough expertize and support within a company toward the supplier's improvement actions. Phase four emphasizes that top management support in essential as well as having straightforward relationships with a supplier's management. A feasibility study is needed in order to for instance identify needed resources and time required by the key projects. It is also important to set up the metrics for the project so the implementation of the performance can be followed. Roles and responsibilities should be clarified in the beginning too. The last phase is status monitoring and strategies adjustment. This is important since unexpected incidents

can happen during the development project and adjustment should be able to be made. (Handfield et al., 2000)

4.4 Critical elements and obstacles in supplier development

Krause and Ellram (1997a) list eight elements for successful supplier development (Table 7). They argue that in order to be successful when conducting supplier development, a company should consider the following elements: (1) effective communication and collaboration; (2) top management involvement; (3) cross-functional teams participating in supplier development actions and collaborating with their counterparts in a supplier's organization; (4) TCO (total cost of ownership); (5) long term relationship; (6) adequate percentage of a supplier's annual sales; (7) supplier performance evaluation; and (8) recognition of a supplier's performance.

Krause and Ellram (1997b) found out in their research that a critical feature of supplier relationship is efficient collaboration and communication. Effective communication should be bidirectional, cross-functional and working on multiple levels between the organizations, a buying company and a supplier. This collaboration includes also feedback giving concerning supplier performance evaluation results. Based on the evaluations a company should give recognition to its suppliers. When a company rewards a well performing supplier, this also further motivates the supplier for better performance and development. Cross-functional teams are crucial for supplier development since development actions and supplier's problems require expertize from different functions. Total cost of ownership (TCO) being the measure instead of the purchase price. If a company purely measures only a purchase price, the quality level may decline the quality level of the products. Long term relationships require commitment from both sites which is essential for strong, sustainable development. Commitment increases the willingness for resource investments. If a company has big enough share of a supplier's annual sales, this given to a company as a leverage to get the supplier along in development actions. (Krause and Ellram, 1997a)

Table 7: Eight elements for successful supplier development (Krause and Ellram, 1997a)

no.	Critical success factors for supplier development
1	effective communication and collaboration
2	top management involvement
3	cross-functional teams
4	TCO
5	a long term relationship
6	share of supplier's annual sales
7	supplier performance evaluation
8	recognition of a supplier's performance

In addition to the eight elements for successful supplier development by Krause and Ellram (1997a), Routroy and Pradhan (2013) defined in their research 13 critical success factors for supplier development in their research concerning supply chain in manufacturing industry. These critical success factors and the ranking based of the research result are listed in the following table (Table 8). In their research was found that when implementing successful supplier development successfully the "long term strategic goal" was identified as the most important critical success factor and "proximity to manufacturing base" coming to second on the importance ranking. Routroy and Pradhan (2013) emphasize that the ranking list cannot be taken as an absolute order of importance of the critical success factors for the supplier development but instead importance of the factors should be individually monitored in every manufacturing company case.

Table 8: Critical success factor for supplier development (Routroy and Pradhan, 2013)

no.	Critical success factor for supplier development
1	Long-term strategic goal
2	Proximity to manufacturing base
3	Top management commitment
4	Information sharing
5	Environmental readiness
6	Innovation capability
7	Supplier certification
8	Incentives
9	Supplier's supplier condition
10	Direct involvement
11	External environment
12	Project completion experience
13	Supplier status

Practicing supplier development brings several benefits to a company. Krause et al. (1998) mention in their research that even though conducting a strategic supplier development process requires more resources compared to a reactive supplier development process, the benefits are substantial. Relationships with suppliers are more deep, confident and strong; suppliers are proactive and willing to contribute to a company's research and development projects; and a company trusts the supplier by involving the supplier to development processes in an early phase. (Krause et al., 1998). Handfield et al. (2000) argue that supplier development actions can influence quality, delivery performance, product innovation, total cost and cycle time.

When implementing supplier development activities, the company can face several difficulties, obstacles and traps. Handfield et al. (2000) argue that obstacles can be originated to the supplier side, to the buyer side or to the connection and relationship between a supplier and a buyer (Figure 13).

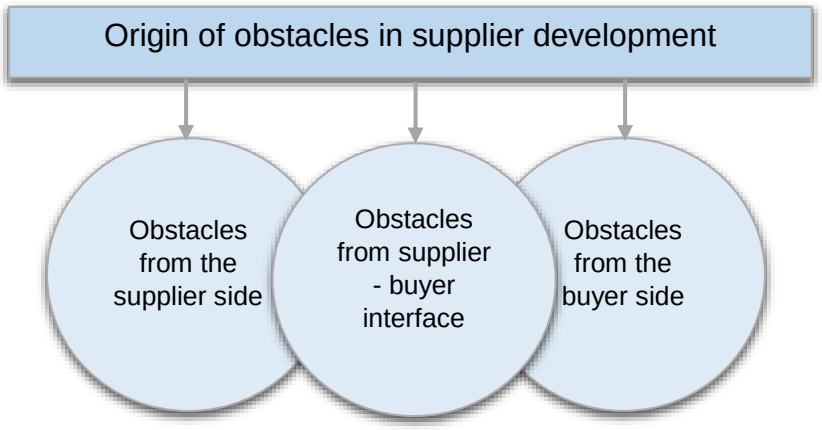

Figure 13: Origin of obstacles in supplier development (Handfield et al., 2000)

Handfield et al. (2000) found in their research that obstacles from the buyer's side are due to missing technical or human capabilities and resources or weak commitment level. The commitment level can be increased by agreeing incentives followed by prompt development and achieved improvement targets. A good way to improve both, the level of capabilities and commitment, is to arrange kaizen –events with the supplier. Organizing kaizen events does not require ample resources but on the other hand unveils low hanging fruits and offers quick improvement benefits. Also, a company can offer trainings and support to its suppliers in order to gain improvements and commitment as well as increased capabilities. (Handfield et al., 2000)

Obstacles from the buyer's side are originated from unwillingness of the buyer to commit. This is due to the fact that a buyer does not recognize the financial benefits of the development. If a buyer uses several suppliers, concentrating and channelling development and investment actions to one specific supplier is not seen justified. Also, if a buyer does not think that a supplier is important enough for further development. In addition, if the top management is not clearly stating the importance of certain supplier development and is not consistently supporting the actions, this effects negatively to the buyer's commitment. (Handfield et al., 2000)

Obstacles that are originated from the interface and relationship between a supplier and a buyer are mainly due to the lack of trust or clear communication between the counterparts (Handfield et al., 2000). As discussed earlier that a critical feature of supplier relationship is efficient collaboration and communication. So, on the contrary, supplier development may

fail if collaboration is not sufficient, effective and real time (Krause and Ellram, 1997b). Also, means how to align organizational cultures to cooperation are essential. The alignment is needed in order to enable smooth supplier development with clear roles and responsibilities. Furthermore, communicating clearly the benefits of development is important to gain a supplier's commitment and willingness for needed investments. (Handfield et al., 2000)

5 RESEARCH METHODOLOGY

This research is a comparative multiple case study and is conducted using qualitative research methods. A case study is defined as an empirical research concerning the actual current phenomenon which has relation to real life (Yin, 2003). It is essential and necessary to use several sources of information (i.e. number of cases and units of analysis) when investigating a phenomenon. Kähkönen (2011) argues that case study interviews are beneficial to finding the consequential meanings related to the phenomenon under the study. Setting questions using *how* and *why* – questions deepens the interviews and analysis.

Following to Yin's (2003) definition of diverse types of case design this study is a holistic multiple case study (i.e. multiple independent cases from the pervasive perspective). This study is not an embedded case study even though some case companies participating this study have business relationships because the research is concentrating on the supplier relationship management on each company, hence relationships between parties (i.e. buyer – supplier) are not under the research scope.

The aim of this study is to understand and illustrate the current status of lean philosophy and principles in a supplier relationship management concentrating on supplier collaboration and development. Qualitative research methods provide an excellent approach an investigating the viewpoints and to form meanings given by the companies participating in this research (Koskinen et al., 2005, 25-31). Qualitative research method is appropriate for the cases when the purpose is, without any pre-consumptions and hypothesis, to examine phenomenon, reasons influencing the current status and to find out the causal connections (Metsämuuronen, 2008, 14).

5.1 Research perspectives

Eisenhardt (1989) argues that a case study research can be executed utilizing one or several cases, and based on an empirical research and evidence the purpose is to create theoretical concepts or proposal suggestions. This case study research is executed by interviewing four different companies. Three of these companies represent the manufacturing industry (OEM) and one represents construction industry. The following figure (Figure 14) illustrates the research companies. These companies were selected

based on the idea that in addition to interviewing only four separate individual companies, the researcher would like to study how the players in the same supply chain are executing supplier relationship management methods with their suppliers. Two of these companies have the customer-supplier business relationships, the dyadic relationship, representing the electronic equipment manufacturing. Selecting this pair the researcher has a personal interest in due to working for one of these companies. The reason for selecting the third company to this research was that the company is supplying for customers of an automotive industry. Lean philosophy has originated from an automotive industry (i.e. Toyota) and the researcher is interested in investigating if the philosophy and principles have spread in the industry and toward upstream of the supply chain. The fourth company is a construction industry player which has done heavy process development and has wide experience on supplier relationship management, collaboration and development.

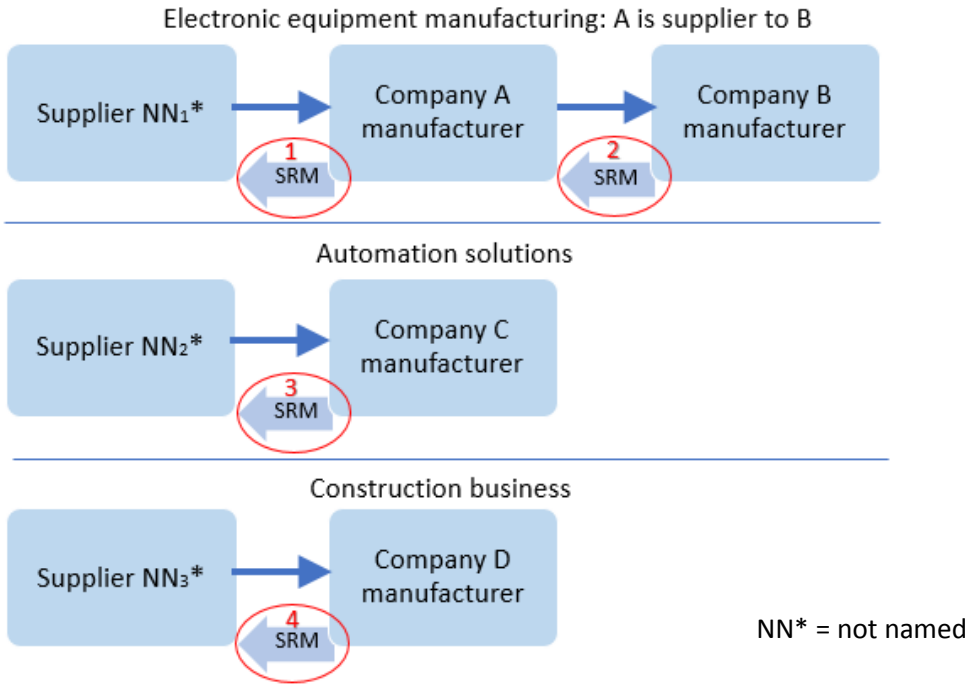

Figure 14: Companies and case numbers of the empirical part of the research

The research has three different perspectives, all from the buying company's perspective (Illustrated in the following figure 15). The first (1) perspective is to investigate how two companies operating in the same supply chain (i.e. OEM, electronics manufacturing business) practice supplier development and collaboration, and how lean influences supply management: **A&B**. The second (2) perspective is to investigate how two companies belonging to the same global corporation but being separate business units, are executing

supplier development, collaboration and lean: **A&C**. The third (3) perspective is to compare practices between an electronics manufacturing company versus a company on construction business: **A&D.**

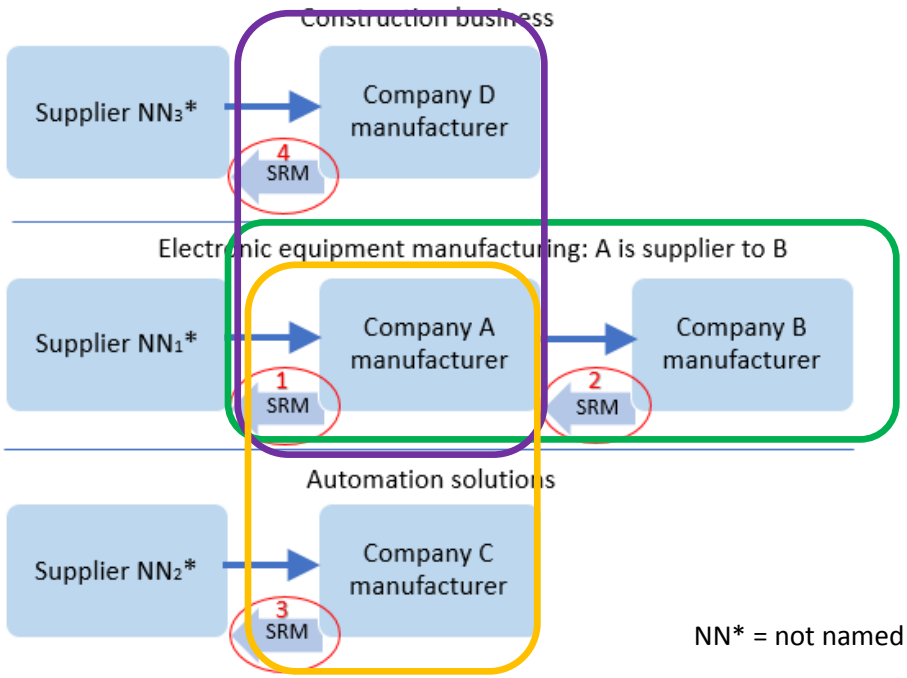

Figure 15: Three different perspectives of the research

In addition to these three perspectives, also internal comparison is conducted between Company A's three different direct categories: mechanical, electrical and electronics categories.

5.2 Data collection

Data collection methods on qualitative research can be divided into primary and secondary material: observations, interviews and open inquiries belonging to primary research material and previous research papers and investigation material belonging to secondary material (Hirsjärvi at al., 2016, 186-189). Interviews, observations, using supporting material and transcription are the most important research methods. Interviews can be conducted in several diverse ways, such as individual or group interview, or using an interview form. Following the qualitative research methodology if using interview forms questions should

be open, meaning answering verbally. (Metsämuuronen, 2008, 220-221, 243-245). The following figure (Figure 16) illustrates the variety of research interviews.

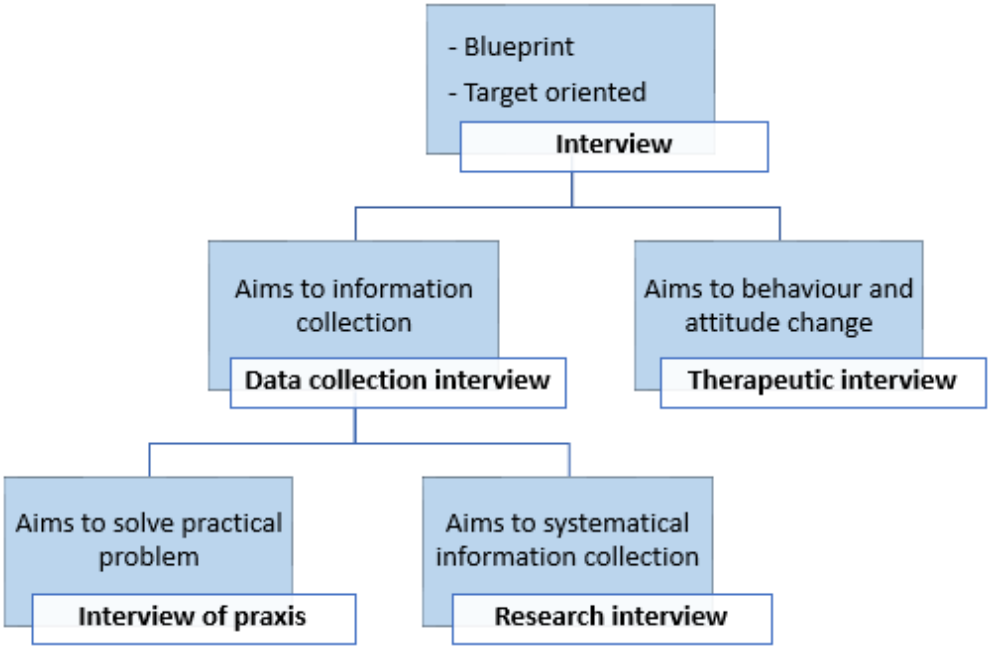

Figure 16: The variety of research interviews (Hirsjärvi and Hurme, 1985, 26)

In this study interviews aimed at information collection being classified data collection interviews and aimed at systematical information collection being characterized as research interview. Interviews were face-to-face semi-structured concentrating on the theme and was guided by an interview script (frame) (Metsämuuronen, 2008, 245-247). Determining the frame for the interviews by having questionnaire which allowed the freedom for the interviewees to tell one's thoughts related to the question. The interviews were carried out as semi-structured face-to-face interviews or via skype, and interviews were audio-recorded. Majority of the interviews were conducted as individual interviews and some interviews were group or pair interviews. Prior to the interviews, the researcher had short skype meetings with one of the participants of each company and went through the questions in the interview script in order to secure a smooth execution of the actual interviews.

The following table (Table 9) illustrates the conducted interviews. The interview script included questions related to supplier relationship management, supplier collaboration, supplier development, supplier performance management and evaluation, and lean.

Table 9: Conducted interviews

Case number	Case company	Number of informants	Number of interviews
1	A	5	4
2	B	4	2
3	C	1	2
4	D	3	2
	Total:	**13**	**10**

The interviewees represented the companies' supply chain management (i.e. sourcing, procurement) function having active daily basis involvement with the suppliers. Table 10 below lists the informants' positions and organizations.

Table 10: The informants' positions and organizations

Case Comp.	Interviews	Number of informants	Informants position and organization
A	1st	2	Category Team Leader; local business unit Finland Category Manager, mechanics; local business unit Finland
	2nd	1	Category Manager, electrical; local business unit Finland
	3rd	1	Category Manager, electronics; local business unit Finland
	4th	1	SCM Manager; local business unit Finland
B	1st	1	Process development manager, global SQM
	2nd	3	Supplier development manager, Europe sourcing Supplier quality manager, Europe sourcing Development engineer, Europe sourcing
C	1st & 2nd	1	Global category manager, electronics; Shanghai, China
D	1st	2	Head of Procurement; Finland Manager, Risk Management; Finland
	2nd	1	Senior Vice President, Operational Efficiency
	Total:	**13**	

5.3 Interview script

The interview script (Appendix: INTERVIEW SCRIPT) consists of questions related to supplier relationship management, collaboration, performance management, supplier development and lean. Interviews began with questions related to supplier relationship management in order to form an overall picture of the procedures belonging to supply management. A company's SRM practices and processes are asked as well as tools which a company utilizes in SRM. Also, supplier selection, classification and reduction procedures are asked, and in addition, identified benefits and challenges. The table 11 below lists the main questions of supplier relationship management. The more detailed interview script used in the interviews can be found in the Appendix.

Table 11: The questions related to supplier relationship management

No.	Topic	Question
1	SRM practices	What kind of practices does the company have for supplier relationship management?
2	Supplier selection	How does the company select its suppliers?
3	Supplier classification	How are suppliers classified?
4	Supplier reduction	Supply base reduction practices?
5	Processes	What kind of common (shared) processes does the company have with its suppliers?
6	Benefits	What kind of benefits does the company gain in the supplier relationships?
7	Challenges	What challenges are recognized? Why?
8	Tools	Which/what kind of tools does the company utilize in supplier relationship management?

Questions related to collaboration concentrate on the collaboration practices and tools. Also, utilization of the concept of early supplier involvement (ESI) was asked. Yet, how trust and commitment influence collaboration. The following table 12 lists the main questions of supplier collaboration.

Table 12: The questions related to collaboration

No.	Topic	Question
1	Collaboration practices and tools	- What kind of collaboration practices does the company have with its supplier? - Collaboration tools?
2	Trust and commitment	Which factors have influence on the level of the collaboration? - What is the role of trust in collaboration? - How is commitment shown in collaboration?
3	Early supplier involvement, ESI	How is the concept of early supplier involvement utilized?

With supplier performance management questions aim is to find out performance metrics a company uses and also tools which are utilized on performance management. Also, questions are stated concerning to performance follow-up practices and if a company executes supplier evaluation process. Also is asked, how performance metrics are utilized and for which purposes measurements are used. The table 13 lists the main questions related to supplier performance management.

Table 13: The questions related to supplier performance management

No.	Topic	Question
1	Performance metrics	What supplier KPIs are in use?
2	Tools	Tools used in performance management?
3	Performance follow-up and evaluation process	- How is supplier performance management executed? - Performance evaluation process? Frequency? Related actions?
4	Practices related to managing the suppliers	How are metrics used and utilized in supplier management?

Krause et al. (1998) suggest in their research several topics and aspects for future study related to supplier development. Some of those points which rose up from their research have been taken into account when selecting and listing the questions for this multiple

comparative case study. In the supplier development part of the questionnaire is asked how the company practices supplier development and how it identifies needed actions. Motivation and rewarding is asked too, as well as development resources. Also, if supplier development brings any benefits or is development hindered by some obstacles. The following table 14 lists the main questions related to supplier development.

Table 14: The questions related to supplier development

No.	Topic	Question
1	Success factors and obstacles	Why is the company conducting supplier development activities? Benefits of supplier development? - Enablers (success factors) for supplier development? - Obstacles in supplier development?
2	Practices	What kind of supplier development activities does the company have?
3	Identification and selection	- How to identify and select the suppliers for the development actions? - How are development areas/topics identified?
4	Motivation and rewarding	- What are the means to get suppliers along and interested into a development topic/project? - Company's rewards and recognition to suppliers?
5	Resources	Resources allocated to supplier development?
6	Development led by the supplier	Is a supplier leading some development actions?

The last part of the questionnaire concerns the adoption of lean principles and practices in a company. Also is asked, if a company can find some sources of waste on practices with suppliers. Yet, if a company is aware of its suppliers lean status is asked. And, if a company follows some lean principles or uses lean tools and practices with its suppliers. Finally, what kind of benefits a company can gain if it adapts lean practices in supply management is asked. The table 15 below lists the main questions concerning lean.

Table 15: The questions related to lean

No.	Question
1	Are lean principles/practices implemented in the company's operations? In manufacturing? In supply management?
2	Can the company recognize some sources of waste (non-value adding activities) in its supplier relationship management, procedures, processes with its suppliers?
3	How does the company see the status of lean on its suppliers? Are suppliers following lean principles? If yes, how?
4	Does the company follow some lean principle and/or use any lean tools and practices with its supplier?
5	Can you see any value/benefits for adoption of lean principles and practices on supply management?

6 INTERVIEWS OF THE CASE COMPANIES

As discussed in chapter 5.1 (Research perspectives), this is a multiple case study consisting of four companies. One to five informants per a company were interviewed. The interviewees, their positions and locations are listed in table 10 in chapter 5.2 (Data collection). Three of the companies that participated in this study represent manufacturing industry and one company is an actor in construction industry.

6.1 Company A

Finland based Company A is a local business unit and part of an international conglomerate company (corporation). Company A manufactures electronics equipment for industrial customers. This local business unit has approximately 400 suppliers. The corporation, to which Company A belongs to, has mapped its sourcing processes to a model called supply base management. This model consists seven phases or processes. These are supplier identification, qualification, onboarding, performance evaluation, classification, development and de-sourcing. Supply base management is a comprehensive model and includes all related instructions and required process steps.

The interviewees that participated in this study were representing each direct category, namely category managers of electronics, electrical and mechanics categories. Also, the SCM director and category team leader were interviewed.

6.1.1 Supplier relationship management practices in Company A

Company A has four main practices when conducting supplier relationship management. These practices are (1) key supplier conference, (2) seasonal meetings (i.e. regular periodic meetings), (3) rating, and (4) management meetings. The company arranges annually a key supplier conference where suppliers are informed about the company's strategy, what are the company's expectations towards its suppliers and also all the actual hot topics are discussed. The supplier responsible category manager is in charge of arranging seasonal meetings with the suppliers. Meetings are arranged quarterly with strategic suppliers and once or twice a year with the other suppliers. Supplier ratings are an important part of the supplier relationship management. Supplier performance is analyzed quarterly following a specific rating tool. Results are communicated to the supplier as a part of the seasonal

meeting (i.e. quarterly business review). Management meetings are arranged with the utmost important strategic suppliers (approximately ten suppliers). The suppliers are selected to these meetings based on spend, business criticality and strategic point of view.

Supplier selection

The general supplier requirements for suppliers are related to cost, quality, availability, financial status and development capability. A supplier should be able to offer competitive price levels for the company, should have proper quality management, should secure material availability and capacity for the company A. Also, a supplier should be financially healthy and solid and also devote good development capabilities. Each category is responsible for maintaining sufficient supplier base to meet business needs. In other words, suppliers are introduced and selected based on business needs in each category. The need can be identified in a R&D (research and development) project if a proficient supplier does not exist on the supply base. Also, a few suppliers per component is needed for price comparison when negotiating prices. The rule of thumb is that at least two to three suppliers are needed per important parts.

The company has a 3rd party service provider doing the first scanning of the sufficiency and capabilities of the suppliers who are interested in becoming a supplier for the company A. As an end result of this first scanning is the pool of potential suppliers. Also, category managers can have direct contacts and search potential suppliers for instance in trade fairs and conferences. However, the first scanning by a service provider is conducted also in these cases. The company has a standardized supplier qualification process (SQP) of how suppliers are audited and qualified. This process is globally consistent including on-site audits and questionnaires. With this process suppliers are finally approved to become a supplier for the company. Process has two phases: on the first phase the supplier itself is audited and if passed the supplier will become a part of the company's approved supplier pool. The second phase is the product audit. The product auditing is a constant procedure concerning also "old" suppliers. If need for a new product occurs the new product is audited even if the supplier is approved.

A supplier is blocked from the selection if it does not pass the first phase of scanning by the service provider or if a supplier does not pass the qualification process and does not meet the basic general requirements. The reasons for blocking are for example: a conflict with the company's code of conduct (for instance related to child labor, business ethics, law),

the supplier is not big enough (i.e. size of the companies should be in balance), the product portfolio is not suitable, the quality is not on a good level, processes and capabilities are missing (i.e. production is shoddy which could indicate quality challenges in the future) or the price that supplier is offering is not competitive.

Supplier classification

The company A has a classification model where suppliers are classified to preferred, approved, conditionally approved and de-source status. New business possibilities on new projects are offered first to the preferred suppliers. All the biggest suppliers are perceived as preferred. Also, preferred supplier's technological know-how is world class. The approved suppliers are used often as back-up suppliers. Conditionally approved means that the supplier potential has been identified but some development actions should be still proceeded before the supplier can receive approved status. De-source status indicates that the supplier quality is always on poor level and the supplier does not even have an interest to improve. Also, a supplier can have a de-source status if the supply base includes too many suppliers. In this case quality, price and development possibilities (i.e. innovation capability, willingness to develop) are scanned and the de-source decision is given based on careful monitoring.

Supplier reduction

As described on the previous chapter the classification status de-source will lead to supply base reduction. The reasons leading to the reduction are related to the total number of suppliers, poor quality level, high price level and insufficient development capabilities. By reducing the supply base and concentrating the business to certain selected suppliers the company achieves buying power. The supply base is analyzed annually as a part of category strategy: the quantity of suppliers and whether current suppliers within the supply base meet business needs. Typically the supplier quantity is driven smaller, but simultaneously it is crucial to ensure that right suppliers, needed technical competence and service level exist within the category. The corporate (to which the company A belongs) has global metric for category maturity assessments analyses which tells how many suppliers represent 80% of spend in each category. The rule of thumb is that supplier quantity delivering the main volume should be from three to four.

Reduction of some suppliers from the supplier base may take years even though if on the category strategy is identified and stated that some supplier share will be reduced in the

future. The reason for this is the after sales service guarantee given to the customers. When products' active phase in production ends the products are transferred to classic phase. Supplier contract defines that the supplier is responsible for delivering the product (component) for instance for the next ten to twenty years after the product's active production.

Currently supply base reduction is not actively conducted in the company. Competitive tendering is done actively for the categories where multiple alternative suppliers exist and where the volume switch is easy. These suppliers can change yearly. Competition on the markets is heavily influencing those categories where it is rather easy to switch supply source.

Processes and tools

The company A has common shared processes with its suppliers such as the engineering change notice (ECN) process, the reclamation process and the annual price negotiation process.

The management mentors procedure was mentioned to be one of the supplier relationship management tools. The company has nominated management mentors to the most important strategic suppliers. The management mentor is one of the company's top management representative. Management mentor meetings are arranged once or twice per year and action list is followed in these meetings. A supplier development plan is one topic belonging to the action list. The supplier development plan is a list of topics to which the company expects supplier to concentrate on the following two years. Another supplier relationship management tool is the seasonal meeting –template. The template includes all the important topics which should be discussed with a supplier on a regular basis. These topics are: (1) the review of targets, (2) business news from the supplier and Company A, (3) inbound logistics news, (4) the review of supplier performance and rating results, (5) availability related topics (e.g. forecasts, capacity, buffer stocks), (6) the cost review, (7) production process changes, (8) R&D projects and news, (9) obsolete materials, (10) ongoing practices and processes, and (11) the action list. The procedure is consistent because the same template and topics (i.e. standard agenda) are reviewed and discussed with other suppliers as well. The third mentioned tool is the supplier rating tool. Suppliers' performance is monitored quarterly basis and these ratings are executed with excel -tool (excel –template). Suppliers are rated on three different perspectives: quality (DPPM,

reclamations), availability (OTD and buffering performance), and cooperation (technical and commercial cooperation) and development (e.g. ability, topics). Rating belongs to the seasonal meeting procedure being part of the seasonal meeting agenda. In addition to rating the performance, the results communication and feedback sharing is also an important part of supplier relationship management.

Benefits and challenges

The interviewees highlighted that the benefits conducting supplier relationship management are manifold and relationship management is one of the success factors for sustainable business. Close relationships with the suppliers are crucial and they increase the level of communication and trust between the company and its suppliers. For instance, when challenges occur in the supply chain the company receives the information first. Then time to react is longer and the company has better possibilities for problem solving before end customers suffer.

The company has had long business relationships with its key suppliers. Trust is in the key role. This is emphasized if extra flexibility or taking a risk is needed from a supplier (for example investing to new production machinery). Cooperation and relationships exist on many different levels in the organizations, from engineers to top management. Top management commitment is extremely important in escalations and solving bigger problems. Through good supplier relationship management the company is seen as a more attractive customer for its suppliers. The company receives extra commitment and willingness from suppliers to support the company. This creates better and faster service from the suppliers. This is emphasized on tough market situation where for instance component availability is poor or if quality issues occur. Also, when having good and deep relationship with its supplier, the company has better possibilities to help the supplier on operation development and, as a side effect, receive benefits itself too.

Interviews adduced balancing as one challenge concerning supplier relationship management. This means when managing the relationship turns to unnecessary micro managing. The category managers do not need to be aware of every little detail of the supplier’s business. Another identified challenge was the personal relationships with the suppliers. It can be tricky to keep up the relationship if a key account manager from the supplier side is not active enough or if there is lack of competence. In addition, lack of time was brought up as a challenge. Meaning time needed to maintain and develop supplier

relationships in all levels. Communication and cultural aspects were identified as challenges. Top management's commitment is essential for contributing productive business relationship.

6.1.2 Collaboration practices and tools in Company A

The company A has a collaboration tool *ASCC* (advanced supply chain collaboration) in use when sharing information with the suppliers. ASCC is a kind of window for suppliers to the company's ERP -system and from ASCC suppliers can see their forecasts, orders, order confirmations, buffer levels, OTD (on-time-delivery) data and reclamations.

The second tool used in collaboration is SharePoint. Supplier SharePoint –sites are important for document sharing and for information exchange. With SharePoint different documents and reports can be exchanged. After all, email is the most important tool for collaboration. Lot of documentation and information are exchanged with email. It is not over exaggerated to say that the main collaboration tool is email. Naturally, phone calls are a daily used collaboration method with suppliers as well.

So called supplier message is sent via email to the suppliers on the monthly basis. The message includes purchasing themes (so called hot topics, e.g. availability issues) and material plan updates for all the suppliers with business sight update showing the realized sales figures and also forecasted sales per product groups. Information in the message is generic concerning all the products, not any supplier specific information. In addition to these above mentioned tool and practices, the company has weekly (or daily) follow-up calls with suppliers if needed. Calls are utilized if some urgent problem occurs. The problem can be related to availability issues with material shortages and component allocations.

The collaboration tools and processes are common to every supplier. Interviewees did not identify any difference between strategic versus operative suppliers except one: top management meetings. The company is arranging annually top management meetings with selected key suppliers. In these meetings more strategic, long term, topics are covered. Such as, joint development topics and future business together.

Trust and commitment

One obvious factor is influencing to collaboration level: supplier status. The company has more open collaboration with its strategic suppliers where proven high level of trust exists. Top management meeting procedure is supporting and deepening the collaboration level. With strategic suppliers more open information is changed, future and business roadmap is discussed. One interviewee stated that: *"It is natural that collaboration with long term trusted suppliers is more open than with suppliers where trust is missing or only short time co-operation exists yet."*

Trust is the key enabler and crucial element for long term successful co-operation. Creation of trust starts from the top management. A big part of the top management meetings are related to building the trust between the companies. Even though this is not directly mentioned. Also, trust is prerequisite for commitment. Support from the top management, trust and openness is supporting the whole organization. Commitment on concrete level can be shown on everyday business. As one interviewee stated: *"Keep your promises and walk the talk."*

Early supplier involvement

The concept early supplier involvement is mainly utilized in new R&D projects. However, the company has lot of room for improvement concerning utilization of the ESI -concept. Sometimes suppliers are connected to the R&D project on very early phase when new solution is under investigation. While, the company is not actively connecting the suppliers to new technology projects. However, the company arranges technological days for systematic product roadmap reviews with its suppliers. At these reviews, suppliers are presenting their roadmap and technological solutions for the product/component they are offering.

6.1.3 Supplier performance management and metrics in Company A

The company is reporting supplier KPI update on monthly basis. Several suppliers' key performance indicators are followed on these monthly updates. Delivery performance is followed by measuring on-time-delivery percentage (OTD %), delivery lead time is measured in days (LT days), and also the quantity of late purchase order lines is followed (Late POL's, qty). The suppliers' buffering performance is followed by measuring percentage of the items that are on an agreed level in buffer stock (% of items on agreed

level) and quality performance is measured using DPPM figure (defective parts per million, DPPM). The suppliers' cooperation capabilities are estimated in a quarterly supplier rating procedure. This is an evaluation given by a buyer and a category manager concerning how cooperation is seen to work with a supplier. These metrics are non-financial and concentrating on measuring past performance. Also, the company follows internally on monthly basis financial metrics: cost reduction percentage and payment terms.

Tools and evaluation processes

Monthly supplier KPI update is reported using a reporting tool. In addition to total figures, on-time-delivery (OTD) and quality performances (DPPM) are measured also on supplier level as well as on category level. The ten worst performance figures receive deeper analysis and the root causes identification and the corrective actions are set to these worst performers. The responsible persons are nominated and the development of the actions are followed.

Also, on-line Power BI (business intelligence) figures are in use. With the Power BI –reports category managers are up-to-date what the status of the suppliers' performance is. However, the most important tool for supplier performance follow-up is the supplier rating tool. With the rating tool the suppliers' performance is evaluated quarterly. An important part of this quarterly evaluation is presenting the feedback to the suppliers. The way the feedback is given to the suppliers is extremely important. The purpose is to go through together thoroughly the reasons behind the results and to identify the corrective actions together. In addition to supplier rating procedure, the company has a global corporation level supplier performance evaluation (SPE) process. This is conducted using corporate's ProSupply –tool and the evaluation is executed once per year. This SPE evaluation is more like a global view of a supplier's performance while on quarterly supplier ratings the company is concentrating on suppliers' performance at that specific business (plant) location.

Practices related to performance measurement utilization

The purpose of monitoring key areas and to communicate the performance on those to the suppliers frequently is to ensure that the suppliers keep focusing on their performance. Systematic follow-up ensures that the suppliers have better possibilities to keep performance on targeted level. On quarterly seasonal meetings thorough performance

analysis is conducted concerning on-time-delivery (OTD), quality, cooperation, lead times and buffering performance. Continuous improvement philosophy is followed together, root cause analysis are conducted and corrective actions are performed.

Cost reduction targets are typically set using top-down approach, meaning a business unit receives its target from the group (corporation), and the target is then divided to local business units and to different categories within the local business unit. Usually the targets are category specific. This means that the supplier cost reduction targets are defined within the categories so that the whole category should meet its target. Also, in some cases first bottom-up analysis is conducted per supplier in order to get the category managers' view of the savings potential and possibilities in that specific category. Then top-down savings targets and bottom-up analysis are combined and a common target is set. Usually a category's savings target is general. However, occasionally a target can vary among suppliers and also supplier specific cost reduction targets are set.

Also, other than cost reduction targets are set annually for a business unit and local business units. The supplier performance targets are for instance on-time-delivery target and target for quality (DPPM). These general targets are then distributed to category and to supplier level. Suppliers are informed about the targets. Supplier payment term targets are given from corporate (top-down) to business units. The company does not have any measurable targets for innovations.

6.1.4 Supplier development in Company A

Flop 10 performers (i.e. the 10 worst performers) on quality and on delivery performance (OTD) are followed on monthly basis in the supplier KPI reporting. Poor performers are selected for corrective actions: root cause analysis is conducted and corrective actions are defined and implementation is monitored. If performance according to quarterly rating results is poor on two quarters in a row then corrective actions are demanded from suppliers. Task force projects (specified development actions) for a selected poor performing area (cost, quality, delivery performance) are defined. Yet, development road maps and targets for selected top strategic suppliers are determined in management meetings. The category manager is responsible for implementation of the agreed development actions since a development road map is a part of the category strategy. These development actions set to suppliers can be very concrete, for example: a supplier

should invest to technology, strengthen English language capabilities, acquire ISO environment certificate, and strengthen competitiveness.
Supplier visits and giving feedback to the suppliers are common practices. When visiting the suppliers' facilities, the company's representative is often using rapid-plant-assessment -procedure (i.e. kind of "tiny-audit"), making safety observations and utilizing 5S procedure. Also, the suppliers are visiting the company's plant. Furthermore, process audits are conducted for some selected suppliers every second year and audit results are extremely important.

Success factors and obstacles

Concerning the supplier development success factors two key enablers were identified. These are trust and top management support. Trust between people and the companies is extremely important as well as top management support. In addition, communication and information sharing is crucial for enabling visibility and transparency of the development activities. These are helping to receive support and commitment from the management and personnel. Sometimes the top management is not informed of the ongoing development activities and this leads to lack of needed resources and financial support. Also, it is important that the right companies are working together. Meaning when working with right counterpart, both companies have motivation and interest towards joint cooperative development actions.

Obstacles of the supplier development can originate from working with the wrong counterpart, lack of trust, bad experiences in the past and lack of motivation. A supplier may not be interested enough for working and developing together with the company. Lack of supplier's interest may originate from missing payback. If payback is not identified, the supplier does not see the company very appealing to work with. Trust is the key and if trust is missing the genuine development liaison is impossible. Also, if earlier development projects have been conducted in an unprofessional manner, this is hindering willingness for future development actions. In addition, supplier development is hard if the company is demanding immoderate actions from the supplier without giving any proper motivation for investment. Also, development activities are slowing down due to lack of resources or lack of priority. These usually originate from the insufficient management support.

The main leaver to remove these obstacles is to involve the upper management to secure the needed support. The involvement of top management is essential for instance to receive

attention to the needed resource or financial investments. Escalation to the top management in some cases is truly necessary.

Identification and selection

The main mean for identifying and selecting suppliers for development actions is monitoring performance daily, monthly and quarterly. Poor performance in quality or delivery accuracy are typical selection criteria when supplier ends up to Flop10 list. With strategic suppliers' development road maps where longer term development targets and actions are defined are in use. Seasonal meetings are in a key role when discussing about the required development actions from suppliers. These could be for instance needed production machine investment or actions for quality improvement.

Also, everyday communication is extremely important in order to recognize and react fast to changes and to preserve a close relationship (i.e. trust, commitment) with a supplier. Though, recognizing new opportunities (e.g. technology, R&D projects) is more complex. Identification for these happen within category teams and with cross-functional collaboration. Also, suppliers' technology days have an important role for identification of new technological opportunities.

Motivation and rewarding

Suppliers' main motivation toward development actions and prompt action implementation is typically the possibility to obtain higher share of the company's spend (i.e. more business with the company) Also, a possibility to reach the strategic supplier position on the company's supplier base is motivating suppliers. This status would influence to the security of the business continuity and to higher share of spend.

With selected key suppliers the company has a supplier development plan procedure (development road map) as a part of the top management meetings and actions. Also, on group level (global corporation) the company has initiatives to have more structured supplier quality develop plans (QIP, quality improvement plan) in place.

The most important and the highest recognition the company gives to its supplier is the supplier of the year award. This is an important motivator also to the other suppliers. However, sometimes this can have de-motivating influence as well. Criterions are strict and rigorous and all suppliers are rated using the same rating scale even though nature of the

production and categories varies a lot. Suppliers in some categories can never receive the award.

As a general comment, good performing suppliers are rewarded to receive more business. Contrariwise, if ending up to flop 10 list and not been able to resolve the problems, supplier's share of business could be transferred to competitors.

Resources

Related to resources allocated to supplier development one interviewee stated that this is the area which requires further development. More resources are needed since currently the supplier development actions are conducted as part-time responsibility with a team of three persons: the category manager, the buyer and the supplier quality manager or engineer. At the moment the procedure is more task force type of development (i.e. reactive) when certain supplier performance is poor and task force team is set up to fix the problems. More proactive development (i.e. strategic) activities are needed.

Development led by the supplier

The suppliers are leading independently some development actions. In general, these actions are for instance as an outcome of supplier management meetings and ending up to the suppliers' development road maps. Meaning, the company has identified and stressed to the suppliers the needed development topic. Actions which would concern both companies (for instance related to new product development) and where development would be led by a supplier were not identified during the interviews.

6.1.5 Lean in Company A

The company A follows some lean principles and executes some lean practices in its operations. Lean principle waste reduction with problem solving practices are conducted in manufacturing. Just-in-time principle utilizing Kanban –boxes is in use for some manufacturing materials. Also, jidoka –principle is followed by executing 5S practice in the production lines and using visual tools. A daily management procedure with visual management methods is in use in manufacturing. Also, daily management concerning material availability is carried out in supply management. In addition, the NPD (new product development) sourcing team's weekly management procedure is established concentrating on R&D projects progression and needed actions. Furthermore, also category sourcing has

just recently started to execute the weekly management practice with visual management methods. Continuous improvement –principle is generally in use in manufacturing as well as working with suppliers. Kaizen events have been conducted internally but not with suppliers. Also, safety is under intense attention (respect for people –principle).

Sources of waste

In the interviews some cells of waste were recognized due to some processes or behavior. These processes are the reclamation process and the ECN (engineering change notice) process. Currently the reclamation process is not working effectively. There are inefficiencies and uncertainties concerning handling and documenting the reclamation; who and how to reply to reclamation, to where to store reclamation documentation, how to use the ASCC –tool for reclamation handling, who is using the information. Also, inefficiencies were identified concerning the ECN –process. The current procedure is that every buyer receives every ECN. This means that everybody opens the ECN and uses time for investigating if ECN is relevant for that person (category) and if some actions are needed. Lot of time is wasted and white collar productivity is deteriorated. ECNs are send from PE (product engineering) using a general ECN email –distribution list. Development is needed concerning both of these processes, ECN and reclamation processes.

Cultural behavior to use emails excessively is generating waste as well. The culture tends to be to send an email in every case even if calling or just saying directly to the relevant person would be possible. Interviewees told that they receive around hundred emails every day. Also, a possibility was identified to intensify the supplier development actions. Currently a systematic supplier development road map does not exist for all relevant suppliers. Implementing this procedure would make development more efficient.

Lean in suppliers' operations

As one of the interviewee stated: "*Lean is todays mantra in many companies*". Lot of development is happening within this area. Some of the suppliers are conducting lean in their operations. However, the company's representatives (interviewees) were not aware of how well or efficiently the suppliers are using lean methods. This gives an indication that lean principles are not systematically utilized toward upstream on supply chain, at business processes with the company's suppliers. One of the interviewee stated that some suppliers are well ahead what comes to lean philosophy implementation comparing to the company

A's status. Meaning, production operations are very lean and many lean practices and tool are in use (for instance 5S).

Lean practices with suppliers

Company A follows continuous improvement principle internally as well as suppliers.
Also, the continuous improvement principle is fulfilled with some of the suppliers. For instance, an electrical category manager told that supplier SharePoint is exploited for continuous improvement actions, that is: task lists with workflow functionality. When finalizing own task the responsible person can transfer the action to the next step (next person responsible) on the process.

The company has executed internally kaizen events and also some value stream mapping. However, according to the interviewees, neither value stream mapping nor kaizen events have been conducted with the suppliers. Though, the idea of executing a kaizen event concerning reclamation process or ECN –process with a supplier was seen very beneficial.

Benefits of lean in supply management

Daily management practices used in own production and in internal supply management operations have been seen very beneficial. It enables everyone to be up-to-date of the status of the operations. The use of this procedure has brought efficiency, transparency and more systematical approach. Also, indirectly well-being at work increases. In addition, conducting some kaizen events with suppliers in the future was identified to be useful.

6.2 Company B

Case company B is an international company manufacturing equipment to its industrial customers. Company B is a customer of Company A. Company B is located in Finland even though it has several locations around the globe. Two interviews were conducted for this study. The first interviewee was a process development manager from a global SQM (supplier quality management) organization. On the second interview informants were a supplier development manager, a supplier quality manager, and a development engineer from region Europe sourcing organization.

6.2.1 Supplier relationship management practices in Company B

Company B has mapped its sourcing process which includes phases as identify, contract, and a manage supplier. Guidelines have been gathered to the manual called a global sourcing operating procedure. The global sourcing operating procedure covers all relevant areas and topics related to sourcing and supplier relationship management including practices such as supplier selection, classification, collaboration, performance management, and development. For instance, this procedure includes guidance for a new supplier onboarding (i.e. supplier operation project management). That is, steps that should be considered when a new supplier is introduced to the supply base. Company B has several practices for supplier relationship management. These are for instance supplier management and contract management practices. Company B uses practices such as should-cost analysis for price comparison, source plan and contract negotiation.

Supplier management approach is dependent on the segment to which a supplier is classified. The management approach includes four dimensions: (1) supplier relationship model, (2) supplier quality management, (3) contract and risk management, and (4) process and system integration. Supplier relationship management includes information concerning the stakeholder, and governance model and structure. Supplier quality management includes information concerning certifications, scorecards, 10xB (“ten times better”, meaning activities to improve quality output). Contract and risk management includes information, instructions and templates concerning contracts, and NDAs (non-disclosure agreement). Process and system integration includes information related to purchase orders, EDI (electronic data interchange) connections, logistics. So, determining systems which are in use when parties, Company B’s and suppliers’, are communicating together.

Supplier selection and reduction

Usually the need for a new component is discovered in a R&D –project. Company B has listed a preferred supplier for each component. If the supplier does not exist for a certain new component, the first step when selecting a new supplier is to list all potential suppliers. To this potentiality influences technology the supplier is providing, size of the supplier (should be adequate: neither too small, nor too big), and capacity. Risk analysis is conducted to investigate for instance if a supplier has financial risks. Source plan is created and RFIs (request for information) are sent to the candidates. After thorough scrutiny of received answers to RFIs, RFQs (request for quotation) are sent to the best candidates. The main criterion for the final selection is the price a supplier is offering.

A prerequisite to become selected is that the supplier has obtained quality and environment certifications ISO 9001, ISO 14001 and in the future also OHSAS. The supplier should fulfill RoHS requirements (restrictions of hazardous substances) and adhere to Company B's code of conduct. If some obscurity if noticed concerning a supplier background or operations, for instance suspicion is caused if a supplier is utilizing child labor, supplier does not commit Company B's supplier code of conduct, or does not fulfill RoHS and other legal requirement, the supplier is blocked from selection. Also, if a supplier is not ISO14001 certified, environmental impact is evaluated using evaluation template, and a high impact supplier is blocked from selection. New suppliers are audited (process audit) by Company B. Company B has quality criteria and a new supplier needs to reach enough points to be selected as a supplier.

Supplier reduction activities are not on scope at the moment. Currently there is rather a need to increase the supply base than reduce because some components have too few alternative suppliers. However, the fact has been identified that a less number of suppliers is easier to manage.

Supplier classification

Company B has a global supplier classification model in use. This model is called segmentation. Meaning, company B is segmenting its suppliers into five different segments. These are (1) global partner, (2) global strategic supplier, (3) unit strategic supplier, (4) validated supplier, and (5) selected use.

Approximately 80 suppliers belong to the first three segments being global partner, global strategic supplier or unit's strategic supplier. Global partners have biggest spend and they are supplying globally to Company B's locations. The number of global partners is four. The difference between global strategic and unit strategic suppliers is that global strategic is supplying globally to different continents while unit strategic being important supplier only for one unit of Company B.

Furthermore, these 80 suppliers are graded to gold, silver or bronze class by following specific certification criteria. This grading is called supplier excellence certification. Criteria topics are supplier management system, supplier audit result, and scorecard result. Concerning supplier management system, Company B is monitoring if supplier has ISO 9001, ISO 14001, or ISO 45001 or OHSAS certificates.

So, the supplier audit results are effecting excellence certification level. Conducted audits are quality system audit (QSA, Company B's own audit) or alternatively DA (diagnostic audit, originated from German automotive industry and modified by Company B), and in addition, manufacturing process audit (MPA, Company B's own audit). The audits are conducted approximately once a year. Furthermore, as stated before, the scorecard result is effecting excellence certification level. A scorecard consists of the following five aspects: (1) quality and KPIs, (2) cost competitiveness, (3) logistics and responsiveness, (4) technical capability, and (5) quality maturity and proactivity. The following figure (Figure 17) illustrates Company B's method of supplier segmentation and supplier excellence certification.

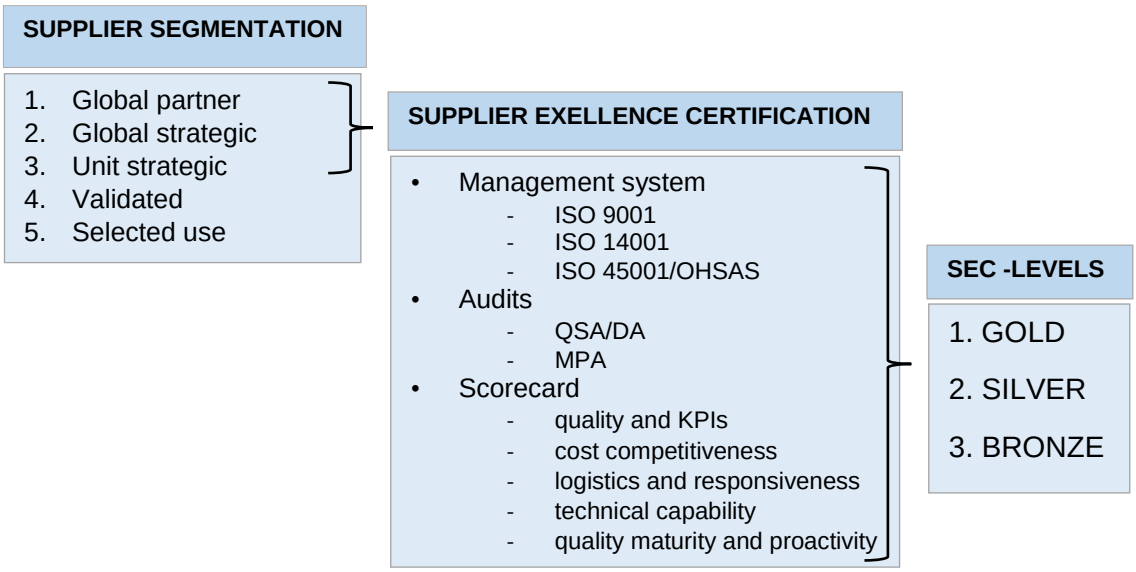

Figure 17: Supplier segmentation, excellence certification criteria and SEC -levels

Once a year sourcing managers (i.e. supplier contract owners) review the segmentation of suppliers. Changes can happen between validated and selected use suppliers. The segmentation class changes rarely if a supplier is segmented into global partner, global strategic or unit strategic. Yet, the supplier excellence certification level can change between gold, silver and bronze. If a supplier wants for instance to climb from bronze to silver level, better audit and scorecard results are required. Approximately 200 suppliers' (80% of spend) performance is followed conducting scorecard and out of these 80 suppliers are certificated to gold, silver or bronze.

Processes

The most important process which overlaps both parties, supplier and Company B, is the NPCI (new product or change introduction) process. This change management process is one of the main shared process with suppliers. This is also one focus area of supplier development. All actions and activities with the suppliers are included in the NPCI process. For example, also system integration connections (e.g. EDI) are included into the process. Company B's PPAP (production part approval process) is belonging to the NPCI –process. The PPAP –process is followed in a product changes or if a supplier is suggesting changes. The supplier needs to provide certain documents (e.g. control plan) to Company B to get the approval.

The supply order delivery process including data transfer and claim process are common shared processes with Company B and its suppliers. In addition, supplier product quality plan (PQP) is a shared process with Company B and its supplier. Meaning both parties, a supplier and Company B, have project managers who jointly execute PQP -process.

Tools, benefits and challenges

Tools used in supplier relationship management are SMP (supplier management portal), PDM (product data management), and SOPM (supplier operations project management). SMP is used for sourcing purposes. These are for instance RFQs, and various self-evaluations executed by the suppliers. PDM is a tool for engineering. Here different product specifications and drawings are stored and are available for suppliers.

SOPM matrix is a tool for project management. SOPM matrix has originated from APQP (advances product quality planning, automotive industry standard) but has been modified to fit to Company B's needs. The purpose of this tool is to systematically manage and control a new product introduction (NPI, ramp-up) for an existing supplier or introducing an existing product to a new supplier. All needed actions for each project phase are listed on SOPM matrix. This tool is needed and used every time in new product development, or during implementation of a second source.

Company B's objective is to be a preferred customer to its suppliers. However, this target brings along a challenge. Too close relationships may risk business practicing. Also, dependencies are identified as a challenge. Yet, sometimes dependency is inevitable, for

instance due to a specific technology the supplier has. In addition, one challenge effecting supplier relationship management is cultural differences.

6.2.2 Collaboration practices and tools in Company B

The sourcing managers have regular steering meetings with the suppliers. Business reviews with the supplier, and operative and global executive steering meetings can be defined as a practice and a tool which Company B utilizes when collaborating and conducting supplier relationship management. Executive steering meetings are arranged between Company B's and partner suppliers' as well as strategic suppliers' top management. At the moment a sourcing manager is monitoring and tracking supply delivery if some hiccup occurs during a delivery process. SQM is responsible for communication of monthly KPI results to the suppliers. KPI reports are sent via email. Also, different project follow-ups and meetings are held with suppliers.

In addition, the supplier day is an important event which Company B arranges yearly. The supplier day is also defined as a SRM tool. In chapter 6.2.4 "Supplier development in Company B" is discussed more about the supplier day event related to supplier motivation and rewarding.

Company B has supplier SharePoint sites which are utilized when sharing project related materials. Also, SharePoint sites are in use for NPCI projects: all project related materials are stored to SharePoint which enables access to documentation for both parties, for all relevant persons. In addition, Company B has a supplier management portal (SMP) with a supplier extranet where the suppliers have their own individual and limited view. For instance, at the moment a supplier is not able to monitor its own KPI results. However, the suppliers have access to view their own contract information. Also, the suppliers can update CAPA (corrective actions, preventive actions) actions and maintain their own certification status. Furthermore, SMP has eRFQ functionality.

Trust and commitment

Company B is quite measurement and metric oriented and managing via "hard" figures and reports. Hence, collaboration level is influenced by regularity of meeting via phone, skype or face to face. Company B has recognized that this regularity and meeting in person when monitoring a situation together increases commitment and trust. Also, when new people come along, it is essential that counterparts meet face to face. This eases collaboration.

Yet, one factor which has influenced the level of collaboration between Company B and its supplier is various trainings which Company B arranges for its suppliers. These help to develop relationship when mutual understanding is achieved concerning for instance requirements, strategy, and tools and processes in use. Also, stronger commitment to the joint target is achieved and a mind of belonging to the same supply chain. The creation of mutual trust is a benefit when conducting supplier relationship management. Face to face meetings are essential for trust and commitment creation.

One challenge related to current collaboration is that Company B's has provided unilaterally meeting content including performance follow-up reports and figures to suppliers. The suppliers have been a little passive and this has impacted on the commitment level negatively. The purpose is to empower the suppliers to take more responsibility concerning meeting content preparations, performance follow-up and self-management of the corrective actions. By this way also the commitment level would increase.

Early supplier involvement

The crucial role of ESI concept has been identified: ESI is an essential part of product development. Due to this, early supplier involvement is a part of the currently ongoing sourcing strategy work. So, the concept creation phase is ongoing. Currently early supplier involvement is practiced so that the same supplier who will be supplying to mass production, is taken along to early phase of the product development project. Also, sourcing is involved in a very early phase when suppliers are selected to the project in order to ensure that the commercial aspects are considered in selection.

Company B has a new services and solution function which is further developing partnership cooperation and collaboration start-ups. In addition, Company B has had tripartite development projects where participants from a supplier, Company B and customer sides have done development work together. These projects are called customer co-creation projects.

6.2.3 Supplier performance management and metrics in Company B

KPI measurements are reported monthly and reported also to the suppliers. KPI measurement is quantitative measuring, meaning clear procedure with explicit way of measuring (calculation formulas) and target figures. These monthly KPIs are: COT

(complete on time), EFR (early failure rate, meaning failures discovered when installing the equipment on site), PFR (production failure rate, meaning failures discovered in production), RST-S (replacement shipment in time – stock, meaning replacement time for defective items; the most critical items which have a stock), and RST-NS (replacement shipment in time – non-stock, meaning replacement time from suppliers for items which do not have stocks).

In addition to these, SQM (supplier quality management) organization follows unique KPIs: FYCOR (first year callout rate), retrofit caused by suppliers and certification coverage. FYCOR considers the time needed for a repair during the first year after commissioning. Retrofit caused by a supplier means quantity of instances some components need to be replaced after commissioning. Certification coverage includes ISO 9001, ISO 14001 and OHSAS coverage.

In addition to these before mentioned KPIs, sourcing follows also savings. Also, project lead time is measured. This is related to and is a part of the NPCI -process. More extensive performance reporting is executed twice a year. This is called a supplier scorecard. Company B is following its 200 suppliers' scorecard results. The scorecard includes, in addition to quality and KPI metrics, also following aspects: cost competiveness, logistics and responsiveness, technical capability, and quality maturity and proactivity.

Tools

Performance measurement execution is a quite manual process at the moment. And, excel is heavily used for performance management reporting. Also, QlikView business intelligence software is used for analyzing and reporting. QlikView is utilizing information from Company B's ERP system (enterprise resource planning) SAP. From QlikView Company B can monitor supplier specific KPIs. Also, scorecards per supplier are visible in QlikView.

However, a project is ongoing to automatize EFR, COT and RST measuring. EFR, COT, RST and FYCOR are measured and monitored monthly. After automatization, these KPIs are visible in the sourcing system. Retrofit caused by suppliers and ISO certification coverage will still remain to be manually measured.

Performance follow-up and evaluation process

As mentioned earlier, in addition to monthly quality and KPIs measurement, suppliers' performance is evaluated biannually on scorecards. On top of quality and KPIs, a supplier's performance is evaluated on a scorecard in four additional dimensions. These are (1) cost competitiveness, (2) logistics and responsiveness, (3) technical capability, and (4) quality maturity and proactivity. Relevant persons give their own gut feeling evaluations compared against requirements when giving grades to the scorecard measurements. A sourcing contract owner, meaning the supplier responsible manager at Company B, gives an estimation concerning cost competitiveness of the suppliers. Estimated topics are: pricing, quotation cycle time, TCO reduction, continuous risk management, problem solving and related reporting, and key account's support.

Material management gives estimations concerning logistics and responsiveness. This consists of activities belonging to an operative procurement. Here estimated topics are: IT integration, PO flow, lead time, delivery flow, flexibility to change, packing, and customer service. Product development persons are estimating suppliers' performance from technical capability point of view. Topics are: engineering support, technical solutions, and traceability.

Suppliers' quality maturity and proactivity is assessed by supplier development persons together with the SQM (supplier quality manager). Supplier performance is evaluated concerning: quality structure and operating model, reports and surveys, traceability, compliance to PPAP, statistical process control (SPC) reporting, new product or change introduction, CTQ (critical to quality) implementation, continuous improvement, problem solving and lean.

In addition to the evaluation of a scorecard, the operative SQM manages supplier performance and quality performance. This procedure includes three steps. (1) The first step is to select suppliers. The target here is to ensure that the right suppliers are on the development scope. (2) The second step is to have/establish a quality improvement team (QIT) with regular meeting practices with suppliers. In the meetings supplier performance and KPIs are monitored. (3) The third step is to establish CAPA management activity with a supplier.

QIT meetings are led by the SQM and the meeting is organized approximately once per month. The standard agenda of a QIT meeting is to monitor KPI, status of corrective and

preventive actions (CAPAs), EFR feedback and related actions, SD and GAP projects, changes (NPCI, e.g. new product ramp-up situation), previous audit result and upcoming audits, scorecard, and supplier's certification level (i.e. gold, silver or bronze). Needed actions are discussed and decided together with the supplier in the meetings.

Other practices related to supplier performance management

The performance metrics are used for daily and monthly level performance follow-up. Follow-up enables reaction in time if some problem occurs. Company B agrees with its supplier how an occurred problem should be corrected, which actions are needed, timetable for a corrective action implementation, and a follow-up procedure. If the indication is that problems are continuing with some supplier and corrective actions are not implemented, it should be decided if for example volumes need to be transferred to another supplier. In this case the problem will proceed to an escalation process for steering committee.

Savings targets for sourcing comes from top down. Different aspects from the market are taken into account, for instance, raw material trends are considered, when the savings targets are set. Levers which enable achieving the savings target are for instance different quality improvement projects and actions for supply chain efficiency improvement, meaning for instance to shorten the delivery time. Continuous improvement praxis is used in QDC – projects.

6.2.4 Supplier development in Company B

Company B has a systematic roadmap for supplier development. Roadmap contains the decided actions to focus on for each year. The result and benefit of this systematic approach is seen on KPIs. Especially the reduction of EFR (early failure rate) has been identified as the biggest benefit of the constant systematic roadmap approach. Top management support is seen as the most important enabler for supplier development. An interviewee told that the head of global sourcing is heavily involved in supplier development and is supporting the actions. The importance of supplier development has been recognized and as a consequence of this and the top management's support, resources have been granted to supplier development.

One big identified challenge is communication. This means, how to communicate to suppliers about the needed and required actions from them. And also, how to ensure that all what is required from the suppliers is also achievable in Company B. Yet, a challenge of

change management is identified. For instance, a new subject adoption requires time to digest since everyone has limited ability to adopt new things at the same time. Also, often suppliers have only one person responsible for all of the development actions while Company B has several resources with specific expertise.

One solution for these challenges is to increase resources, namely, dedicate more resources to supplier development actions. Also, proper planning for development actions execution is essential. Not too much at one fell swoop.

Practices

Company B executes operative routines related to supplier development, such procedures as QIT and CAPA as discussed in the previous chapter 6.2.3 (Supplier performance management and metrics in Company B / Performance follow-up and evaluation process). In addition to these, Company B has established a procedure of QPO (quality passport organization) together with a training program. QPO has been established in order to secure quality and ensure that the suppliers are acting accordingly. QPO includes three roles on a supplier's site, such as a quality sponsor (representative of supplier's top management), head of quality with managerial responsibility and a quality champion which is the key specialist. These three supplier's persons are Company B's supplier quality manager's contact points of the supplier site, quality champion being the first contact point. Also, all quality related topics are informed via these three persons.

The QPO training program has three levels. The first level is introduction of QPO and presentation of the concept. At this level for instance a supplier excellence certification, KPIs and a supplier scorecard is presented. The first level is carried out using suppliers self-training set and subsequently a test is executed to verify the adoption of the concept. The second level is to provide on-site training of tools and applications. These are for instance, core tools of quality management such as CTQ analysis and execution, and FMEA (failure mode and effect analysis) together with control plan, problem solving using 8D method, and audit practicalities.

And, the third level of the QPO training will be deployed this year. This is on-site training concerning improvement and development practices and procedures. This third level is concentrating on lean manufacturing practices and tool, such as visual management, value stream mapping (VSM), continuous improvement (kaizen), 5S and waste identification and

elimination. Also, mistake proofing is introduced. Mistake proofing is following the poka yoke (error proofing) practice which belongs to the lean philosophy's Jidoka –principle. In addition, 6 sigma method is introduced for process improvement.

Mistake proofing and NPCI are on focus in Company B's supplier development actions. The aim is to ensure high quality (zero defects) in critical to customer solutions and enable an efficient new product or change implementation.

Identification and selection

Company B monitors on a yearly basis the suppliers which should be on scope of quality and development activities. The criteria to be selected to scope are spend, segmentation and criticality. These suppliers should cover 80% of spend. Yet, the suppliers should be classified to segments global partner, global strategic or unit strategic. The supplier's criticality is determined by a regional SQM manager. Criticality can be for instance based on the criticality of the components the supplier is providing or criticality of the customer. The suppliers fulfilling the before mentioned criteria are taken along to development actions provided by Company B.

Development topics are selected for example according to a SQM roadmap. For instance, mistake proofing is identified on the roadmap as a key focus area. Also, trainings for all or for the most important suppliers are arranged. In addition, the actions with the biggest achievable benefits are executed (e.g. critical components). KPI performance is not in a big role when identifying and selecting the development actions. Besides, when deciding re-auditing schedule: if a supplier's previous audit result was good and also KPIs are on a good level, re-auditing may not be conducted that year.

Motivation and rewarding

Company B organizes a yearly supplier day event where awards from four different fields are given. The best performing suppliers are awarded from quality, collaboration, value and co-creation perspectives. The sourcing management decides who will win the awards based on feedback also from other functions. For instance, the winner of quality award is suggested by the SQM organization. The collaboration award is given to the supplier with whom the relationship and collaboration is going smoothly. The co-creation award is related to the joint-development actions. And value means the value a supplier is creating to

Company B. These awards are handed over to the suppliers who have been performing really well and are also showing example to the other suppliers.

Also, another recognition Company B is giving to a supplier is a supplier excellence certification when a supplier achieves gold, silver or bronze level in the company's certification system. The supplier excellence certifications are acknowledged also in the yearly supplier day event. Yet, Company B presumes and necessitates that the suppliers are in line with the development actions and are participating in trainings organized by Company B. The suppliers have found trainings arranged by Company B very useful. Especially the QPO (quality passport organization) development program has been found very beneficial in general too. Certainly, the best recognition a supplier can achieve is to get more business with Company B.

Resources

Company B has put great amount of effort in building the supplier quality and development organization. The organization has been systematically built by giving an adequate amount of resources and this action has been strongly supported by the top management. Company B has realized that investing in pervasive supplier management organization with ample quality and development functions gives enormous benefits to the company even if the investments required have been also quite grand.

Supplier quality management organization consists of three main areas that are supplier operations project management (SOPM) with a supplier operations project manager, operative supplier quality management (SQM) with supplier quality managers and engineers, and supplier quality development (SQD) with a supplier quality development manager. The supplier operations project manager's main task is to ensure that the suppliers are fulfilling all needed tasks for NPCI in order to ensure on time product releasing. The main task of the supplier quality managers and engineers is to ensure the suppliers continuous improvement by monitoring the key suppliers' quality performance and providing support and guidance. Suppliers quality maturity level and supplier performance improvement are the main drivers for the supplier quality development manager. To ensure this development the supplier quality development manager is leading various development programs and activities. In addition to these three areas, the global supplier quality management organization includes also two more roles. A global SQM category manager, who is coordinating category specific actions, and a global SQM process development

manager, who is in charge of process development, such role is ensuring that processes are globally consistent and utilized.

Development led by the supplier

An interviewee stated: "*We set requirements which suppliers implement*". Usually once a year the development projects are determined and then the progress is followed on a regular basis. For instance, the focus area this year is mistake proofing solutions to CTQ. The target is that suppliers could independently manage development projects and regularly report results to Company B. Company B offers support if needed. The progress is monitored in QIT –meetings. In these meetings Company B gives feedback to the suppliers if some potential problem is identified concerning some other subject.

6.2.5 Lean in Company B

Company B is utilizing lean practices in manufacturing as well as in supplier management. Company B arranges lean trainings to its own personnel as well as to the suppliers. Company B's manufacturing has daily management practices in use, as well as visual management and Kanban systems. 5S practice is the most common practice conducted. Also, kaizen events have been organized internally. Company B has created its own model which consists of different kaizen levels. These are daily kaizen (i.e. present state maintenance), project kaizen (i.e. cross organization team set-up for a special project in order to improve current status) and support kaizen (i.e. PMO, project management office, for bigger development projects).

Waste

Related to recognition of waste a few processes were identified. Claim management process and product change approval process were identified as sources of waste. Claims flow from installation sites (i.e. front line) via factory to the suppliers. The process has several steps and quite many people are handling the claims. Also, misinformation occurs in the process which amplifies inefficiency of claim handling. In addition, waste of time and inefficiency was discovered in the product change approval process. The change process involves several approval steps which mean waiting for approval from certain persons.

Currently SQM's conducted reporting of supplier performance requires manual work. A development project is ongoing to automatize reporting. Also, the quantity of emails is

massive. One interviewee stated that, "*A big part of the working time is wasted going through all the emails received*." And, a necessity of all sent and received emails is uncertain. Also, inefficient meeting practices were identified as one source of waste.

Errors in specs can cause production stops at supplier site. This means that some information is missing or incorrect at specification provided by Company B which should instruct a supplier in component or module production. These errors are currently tightly followed and a supplier is compensated if the supplier cannot utilize production capacity efficiently due to insufficient specifications from Company B. In addition, poor forecast accuracy level and fuzzy demand information creates bullwhip to the supply chain. Suppliers work overtime although it would not be needed. Inventory levels grow and supply chain inefficiency increases.

Lean in suppliers' operations and lean practices with suppliers

Company B evaluates the level of visual management when visiting supplier's production facilities. During supplier audits the level of 5S is evaluated. Company B has discovered that the level of lean utilization varies a lot between suppliers. Especially differences are seen between categories. The suppliers of a certain category are more "lean" than some other category suppliers.

As mentioned earlier the agenda of QIT meetings with a supplier include also corrective actions follow-up. Continuous improvement principle is followed with the suppliers. Also, systematic waste reduction mindset is utilized for example concerning delivery times. The aim is to obtain stable delivery times, meaning deleting the variation which increases a bullwhip effect in the supply chain. Also, Company B has different development projects with its suppliers. Topics of these lean related development projects are for instance 5S implementation or mistake proofing in processes and in products. Company B aims systematically towards better lean adoption of its suppliers by organizing trainings and also demands suppliers to commit a lean way of working and to develop their own processes.

As discussed in chapter 6.2.4, the third level of QPO training, which is about to begin, concentrates on lean manufacturing practices and tools. Company B started more than five years ago giving basics of lean -trainings for suppliers. However, QPO lean training is a deeper dive to lean tools and principles. Topics in this training are for instance visual management, mistake proofing, standardization, and 5S. After trainings new SD projects

will be started with the suppliers in order to utilize the learning from the training and to bring concreteness to the theory. One target for development projects with the suppliers is the elimination of waste in processes.

Also, Company B's aim is to conduct VSM with its suppliers in order to identify waste (waste of money, resources or time) in a supply process between Company B and its supplier. The target is to achieve process savings through identification of the value add and non-value add activities on value stream, and to eliminate the non-value add activities. And finally, to create a future state map and to change way of acting accordingly. Though, some VSM and kaizen events have been earlier conducted with some suppliers but this execution has not been systematic. Also, Company B has had some projects related to suppliers' manufacturing process evaluations aiming to increase efficiency by set-up time reduction.

Also, quick changeover projects (SMED, single-minute exchange of die) have been executed with suppliers. This means that SQMs have participated and consulted suppliers at their facilities to improve production process effectiveness by quick product changeovers. This increases efficiency and service level, and reduces inventories. These SMED -projects can be categorized as kaizen events while the aim is to continuously improve the production process. In addition, problem solving and continuous improvement (kaizen) events have been organized with the suppliers concerning packaging in order to secure efficient packaging and to prevent part losing and damages.

Benefits of lean in supply management

One interviewee stated that he "*would base everything on lean."* He argued this statement saying that adoption of lean philosophy as a basis for organization culture brings several benefits. Simplified what it means to act according to lean is: to shorten order-delivery -process lead time in order to collect money faster (i.e. better cash flow). Reduction of inventory levels increases inventory turnover. Inventory level reduction has been enabled by shortening changeover times which have enabled the production of smaller production batches. When following lean, this means that the self-driven and self-steering way of acting increases, waste identification and reduction has an essential role. Also, quality improves (quality level increases), collaboration and communication are on better level, time management is efficient, efficiency increases, and productivity improves.

As an example, while suppliers' delivery times have shortened, the ability of fast deliveries to the customers has increased. Also, standardizing package labeling on the suppliers' deliveries has streamlined the goods receipt process and eliminated waste on inbound logistics. Following PAP (part approval process) –process enables standardizing of the quality of acting. To be able to deliver and expand lean philosophy and its practices, the management support is crucial.

6.3 Company C

Company C is a global business unit belonging to the same global corporation as Company A. Yet, belonging in different business units. Company C is manufacturing automation solutions to its customers on the industry field. Related to this study, the interviewee was a global category manager of electronics, based in Shanghai China. Two interviews were conducted via skype with the same interviewee.

6.3.1 Supplier relationship management practices in Company C

Company C expects its partners to be global. The prerequisite for suppliers is that they need to have a global footprint. This means that suppliers should have a global organization providing production capacity in Europe, Asia and Americas, meaning having a global footprint.

The most important supplier relationship management practice is QBR (quarterly business review) meetings. The fourth QBR meeting of the year is called annual review meeting. This meeting wraps-up the year and preparations for following year is made. QBR meetings participants represent different cooperation aspects. Meaning R&D (new product development projects), quality (quality improvement plan with supplier), sourcing, purchasing, value chain (capacity management, component allocation), after sales management (maintenance). This means that the participants represent the whole chain not just upstream supply chain (i.e. sourcing, purchasing). The agenda of the QBR meetings consists of overview of ongoing projects, review of the KPIs, a strategy review, and propositions of new topics which could be taken into the next QBR agenda.

Supplier relationship management is "day-to-day" work. Monthly reviews are held with different expertise areas (for instance quality, value chain). The company wants to develop constant communication between the owners of the solution. Responsibilities belong to the

different level of the team and the team members work together. It is important that they are aware of the target and proceed with the day-to-day work, monthly reporting and follow-up. This is called alignment and systematic communication between the organizations of the suppliers' and the company C's. In addition, different workshops are belonging to SRM practices. These are held on need basis within different areas. For instance, the workshop can be quality related workshops.

Annual negotiations are one of the SRM practice of the company C. Supplier day is a global event organized on a yearly basis for the key suppliers. Various current topics are covered in this event and also the company presents the market situation, performance and the supplier of the year is rewarded.

Furthermore, important for the supplier relationship management is to align and review periodically the organizations for optimum communication. It is crucial that the right people of the all functions from both parties (the company and supplier) are communicating and collaborating. The aim is to eliminate misalignment and to avoid unnecessary communication which overloads people. The target is to have right balance, right level of communication and between the right functions. And also, a right meeting, used for the right purpose and right communication channel. The objective is to seek maximum efficiency and to avoid wasting time with a wrong subject with wrong stakeholders. This procedure follows Lean philosophy.

Supplier selection and reduction

The corporate has overall criteria's for supplier selection. These selection criteria's of Company C are consistent with the criteria's of Company A while both companies belong to the same global corporation. In the very beginning when need for a new supplier occur the global corporate level supplier pool should be reviewed if a needed supplier already exists in the supply base. Preselection phase is conducted by a third party service provider. The following aspects are covered in preselection: financial background information, quality topics, certifications, environmental topics, and ethics. The suppliers should be able to commit to a supplier code of conduct. In addition, a supplier's ability to provide after sales service is crucial while the company has committed to its customers provide spare parts after product's active phase. This classic phase after sales service promise can be up to twenty years. The corporation has global contract framework (template) which Company C

should utilize and implement with a new supplier. SQP (supplier qualification process) audit is conducted if a supplier is selected to be a potential new supplier.

Additionally, there are some category specific criteria's which the suppliers should meet. The category strategy determines the need of the supplier business model (e.g. high mix – low volume, high volume – low mix) or if there is need for design services or also for after sales services. In addition, a need for global manufacturing footprint is considered in supplier selection: to build a supply chain that is matching and giving the best integration of the partner. Also, important aspects when selecting a supplier are industrialization capacity, strategic compatibility, and engineering and design capability. Sometimes the suppliers are asked to propose new technical solutions, even to challenge the company C's solutions.

Supplier reduction and rationalization of supplier portfolio is driven by a category strategy. The category strategy is updated every second year. On CIPS (continuous improvement process sourcing) quarterly review the activities' alignment of the strategy is reviewed and possible future changes effecting to strategy are monitored. An outsourcing plan is scrutinized due to the company's concentration to core competencies. RFQ (request for quotation) rationalization means that RFQs are directed to the preferred suppliers, meaning not to increase the supplier base. Also, after sales service operations require rationalization. Rationalization denotes optimization of dual sourcing for after sales supply. All these before mentioned aspects have an impact on the supply base reduction. The target is to build a sustainable supplier portfolio and to have a right number of suppliers with specific competencies in specific areas. Also it is important to have the right level of dual source for the critical components and modules. The rationalization plan (supply base reduction) is executed once having visibility of the overall situation in an alignment with the category strategy.

Supplier classification

Supplier classification follows the same procedure as with the company A. Different classification statuses are preferred, approved, conditionally approved and de-source. The company C aims to do business with preferred suppliers. This means that business should be allocated to the preferred suppliers and keep approved status suppliers as back-ups.

Company C divides suppliers by type, such as electronics suppliers, OEM/ODM (original equipment manufacturer/original design manufacturer) suppliers, EMS (electronics

manufacturing service) suppliers or distributors. A preferred supplier of these different supplier types should be worked with. KPI performance is tightly followed and an ARM (annual review meeting) conducted. Also, suppliers' project performance is followed and monitored. Company C selects its suppliers by type to fulfill the company's demand. Different leverage for development depends on the type. Meaning for example to deliver a global development plan for EMS company in order to embed the supplier in Company C's value chain.

Processes and tools

The interviewee stated the processes can be aligned more than shared and that is depending on the category and the need of alignment or share. The interviewee told that they explain to each other (the company representatives and suppliers) the processes in order to understand better KPI measurement and to improve communication and reporting. Product development projects are usually quite aligned and also quality workshop can aim at process alignment. The interviewee emphasized the importance of the process alignment for efficient collaboration and information sharing.

The most important and commonly used tool for supplier relationship management is the QBR (quarterly business review). The company C uses also syncronix –excel tool (platform) for negotiations with its suppliers. E-sourcing tool is used for RFQs with the suppliers. The company does not use SharePoint sites with its suppliers. However, the interviewee stated that RFQ and cost management tools are more like tools for process sharing, not tools for SRM.

Benefits and challenges

Company C pursues to develop partnership relationships with its preferred suppliers that are providing product solutions. This is related to the vision of the value chain together with the automation strategy of the manufacturing plant. To develop partnership, to develop right supplier portfolio, and right value chain that is answering to the expectations about what to outsource and what to keep in-house. An essential benefit of SRM is to have the right organization in terms of outsourcing that supports the production strategy.

Collaboration brings efficiency and the value chain is more agile and able for fast reactions when changes in business environment occur. Supplier relationship management enables better development that benefits for instance the automation development in the company

C’s plant at the right level. Also, supplier relationship provides access to the new technology. In addition, suppliers’ support is needed starting from product design and throughout the whole product’s life cycle till the product achieves classic phase. Properly managed supplier relationship benefits both parties.

The biggest challenge at the moment the company C has with supplier relationship management is the ongoing evolution and change from traditional KPI driven supply chain partnership management to embedded partnership in value chain. On traditional KPI driven supply chain a company concentrates on QDC (quality, delivery, cost) projects in order to enable better supplier output. This ongoing value chain development necessitate change and development both internally within Company C as well as with the suppliers. After this, as a next steps, also cooperation plan and shared investment strategy are needed.

6.3.2 Collaboration practices and tools in Company C

Collaboration practices can be divided into daily, monthly, quarterly and yearly practices. Collaboration can be defined as a mix of tools, reporting and periodical meetings. Daily collaboration can be defined as daily operational cooperation. This is executed with the shared tools like email, phone and ASCC. ASCC (advanced supply chain collaboration) is a platform to share forecast information with the suppliers. Monthly collaboration consists of a monthly performance review in form of KPI dashboard. Also, critical component availability situation as well as capacity levels and quality topics are monitored on a monthly basis. In addition, VMI (vendor managed inventory) stock levels are scrutinized with the suppliers. All preferred suppliers' have VMI set-up with Company C. In addition to email, phone and ASCC, also monthly reporting and meetings can be characterized as collaboration tools. As mentioned also earlier, Company C does not use so much supplier SharePoint sites in collaboration.

Quarterly Company C has QBR (quarterly business review) meetings with its suppliers. This was described on chapter 9.1 as belonging to SRM practices. Yearly collaboration practice is the last QBR meeting of the year in which the whole year is kind of wrapped up. Also, in yearly collaboration practices belong cost and price negotiations where syncronics -excel tool is used with suppliers. Topics of yearly negotiations are for example agreed cost strategy of new products, volumes and design.

Company C has tighter collaboration with the strategic suppliers and the strategic suppliers have deeper integration in the value chain. Company C expects more from the strategic suppliers, for instance early involvement, to provide supply chain analysis, to support management of sourcing chain and indications of how to develop the value chain together.

Trust and commitment

Collaboration level with a supplier is influenced by the supplier type, level of integration, and the supplier's ability to share strategy and practices with Company C. Trust has an essential role when Company C is on the path of transformation from supply chain toward value chain. In the new collaboration model the integration level will increase. This means supplier will become more responsible and liable to Company C. As the interviewee stated: "*We are not only asking supplier to have certain level of ppm, to deliver on time and give us every year x% of cost reduction.*" Suppliers need to have a mindset of continuous improvement, to be a solution provider, to integrate design activities, to participate in shared workshops. In addition, to deliver new organization and tools, new potential, and new choices for sub-supplier. A supplier will become a partner of Company C and trust is crucial in the partnership.

Commitment of suppliers is shown practically in the form of supplier behavior and actions. Highly committed suppliers have a drive and motivation towards cooperation. They are agile and have ability to anticipate changes. The suppliers are committed and also eager to continuously improve practices and processes. Company C appreciates if suppliers provide solution proposals for an identified problem or a technical challenge. In addition, the interviewee stated that Company C expects suppliers to challenge Company C's procedures. These are signs of behavior if trust and commitment exist in relationship. And, as the interviewee stated without trust there is no possibility to have business with Company C.

Early supplier involvement

Early supplier involvement concept is quite new for Company C. ESI–concept is mostly driven by a product development project. This means that suppliers are integrated to a new product development (NPD) project in a design development stage.

Last year the question concerning ESI was addressed to suppliers: how the suppliers see the status of ESI with Company C and if Company C was executing the concept in the right

way. Company C selected some projects and deployed an interview process with the suppliers and also with the company's own personnel in order to have a big picture of the current situation. As an end result of the interviews the implementation phase is starting to renew Company C's processes and tool to drive ESI. Company C is really keen to deploy ESI with tier one and tier two suppliers. Though, as the interviewee commented, "*We probably change the way we do at the moment."*

6.3.3 Supplier performance management and metrics in Company C

Currently Company C follows KPIs such as OTD (on time delivery), DPPM (defective parts per million), FFR (field failure rate), SOR (speed of resolution), and savings (continuous improvement of cost of products). Currently KPIs are mainly measuring past performance. Yet, related to the transformation from supply chain to value chain there is need to develop additional indicators to represent the value-added of value chain.

SOR metric measures the time when Company C notices some error in a component or in a product delivered by a supplier. When Company C detects the issue, it reports failure discovery via ASCC system to the supplier. When the supplier receives the information it should immediately acknowledge the reception and start to proceed with a problem solving analysis. The speed of resolution takes into account the time used by a supplier after receiving the acknowledgement to coming back to Company C with analysis.

Even though, mainly DPPM metric is used for measuring past performance, Company C is using this metric also for guiding future performance. This means, when launching a new product DPPM level is forecasted. This evaluation of future DPPM level is based on the analysis conducted by a supplier. Also, improvement levels for future DPPM are estimated. This way a supplier is investing to DPPM evolution and the supplier's commitment level increases too. In addition to before mentioned past performance metrics, Company C is following suppliers' capacity situation compared to forecasted demand (future capacity utilization level). This way the suppliers' efficiency is understood and also future investment needs are identified in an early stage.

Performance follow-up tools and evaluation process

Excel is the tool for performance reporting. PowerPoint is utilized when presenting the status and results, for instance in QBR meetings. In addition to excel and PowerPoint, the interviewee added two more "tools": project achievement and process alignment in supplier

organization. While he stated that he sees a tool more related to a specific project that Company C is sharing with its counterparties. Project achievement indicates how within a certain project Company C can measure the development. Process alignment in supplier organization indicates how much Company C and its supplier are in alignment and how to improve. Meaning for instance deliverables of the project are related to design or industrialization. The target is to find out if Company C is working with the supplier in the most optimum way.

Company C evaluates the suppliers on a yearly basis following the corporate's SPE (supplier performance evaluation) process. In addition to this evaluation process, Company C executes annually supplier audits where performance, processes and practices are thoroughly evaluated. Though, the most important forum for supplier performance evaluation and progress monitoring is the quarterly QBR meeting. In these meetings progress of different activities is followed throughout the year. The meeting participants from different expertize fields discuss and agree on the next needed actions. In addition, different projects have progression follow-up meetings. Also, QIP (quality improvement plan) is followed on a regular basis and needed actions are taken.

Practices related to managing the suppliers

The interviewee stated that at first it is needed to verify that suppliers understand the KPIs and different metrics. This means that the suppliers should have good understanding about the metrics and how to improve the performance. In addition, it is needed to have understanding about the information sharing platform (ASCC). It is essential to review with the suppliers the plan for the year in order to have common understanding of the targets and to ensure good continuity of the plan.

Team alignment is crucial in order to ensure efficient supplier performance management and enabling the best possible outcome. This means one needs to make sure that everyone has the right interface to work with. The interviewee stated that since Company C is developing towards value chain organization, interaction with a supplier is not just conducted by management meetings but rather have experts globally and locally driving their own area of expertise and performance with the supplier. This is leading to full cross-collaboration with the suppliers.

Related to the identification of cost reduction targets, Company C's global category manager proposes cost saving activities and a target. Company C's global category manager is the owner of the strategy and some KPIs such as cost saving. So the category manager proposes cost saving activities and the target for the year to come. When evaluating cost saving targets the global category manager considers all the related activities, taking into account negotiations, annual volumes, annual value rebate, re-design project, dual sourcing, and changes of component supplier. A proposal of cost saving targets is validated internally by Company C. Also prior to the proposal, the global category manager reviews with the suppliers what is their consideration for the cost savings opportunity.

Since the organization is under transformation, the interviewee believes that in the future with the new organization, with a new process and integration of ESI, Company C should have better access to new technology and new proposals from the suppliers. This leads to better flow to re-design activities which results in cost optimization, in other words, cost savings. Also, in the future along with a new SD set up, new targets will be defined for how to measure or how to identify a further project or potential to improve, not only supplier performance, but also performance of Company C.

6.3.4 Supplier development in Company C

As stated previously, Company C in under an organizational transformation. The criteria for development of the new value chain model includes also a need for supplier development. This means that also the supplier development team is under construction and deployment within Company C's new value chain organization. To collaborate with truly embedded partners and share strategic development plan will benefit the value chain optimization. Due to this ongoing development, the interviewee commented that he cannot provide very structured answers concerning supplier development since change is about to happen.

Company C has a dedicated supplier development (SD) team. However, due to the ongoing renewal of the organization structure while the model changes from supply chain to value chain, some resource changes are still happening. The SD team is cross organizational having a global SD manager with local resources. Supplier development is involving different stakeholders from SCM and R&D. Currently Company C has supplier development activities but does not have supplier development programs at the moment. Yet, these are coming along with the new organization structure of value chain and the new team of SD.

Corporation is heavily guiding and supporting business units to invest in supplier development.

Company C has just introduced the new organization to the suppliers and started ESI activities. Supplier development related activities are under development. So, definitely in the future there will be some project allocated to be led by a supplier with input from Company C.

Currently the supplier development practices are annual audits and follow ups, QBR meetings and workshops. Workshops can be related to some development project or a workshop can be related to a specific topic, for instance quality improvement and how to support a supplier. Yet, supplier development practices and processes are under development at the moment as stated earlier. The practices are about to change following the new model accordingly.

Success factors and obstacles

The most important identified factor enabling supplier development of Company C is management support. The management is supporting end to end model throughout the value chain from second tier suppliers to end customers. Naturally, this includes also supplier development activities. In addition, Company C's SCM organization's has an important role to support the value chain transition and supplier development. Also, a dedicated team in supplier development which is supported by a category is an essential success factor. However, the interviewee stated that setting up the organization and team is on a really early stage. This work includes process development and alignment of tools, all related activities and practices, and communication with a supplier. This is tremendous work and a lot of parallel actions are required while moving from the more traditional supply chain model towards the value chain supplier development mindset. After the supplier development team is set up, Company C will have capacity to support the suppliers and to share information by explaining the new model and trying to get the suppliers along and committed to the new value chain model, and to share strategy and vision with Company C.

Some suppliers are very aware of the ideology behind: what it takes to develop and to grow together in order to achieve competitive advantage. However, some suppliers are not at the stage to understand the value chain concept. This is identified as a risk, obstacle for supplier

development. Some of these suppliers may not be willing to adopt the new model. So, obstacles which are slowing down the development activities are related to the new model and the organizational transformation. These obstacles are for instance delays when implementing the supplier development team and delays when implementing new processes, tools and activities.

There are clear solutions to prevent these obstacles. These are to keep focus on following the plan and to have clear communication and transparency with all of the suppliers. Transparency means sharing strategy with suppliers and communicating distinctly about the expectations towards them. These are enablers for business cooperation, like design cooperation, ESI, and real-time information sharing.

Identification and selection

Monthly KPI evaluation of the suppliers' performance is utilized for identification of development needs. Company C reports the performance to the suppliers and how Company C sees it. Also, quarterly QBR global meetings are important especially when reviewing the suppliers' global activities. This means that supplier performance in different production locations can be compared. This is important when allocating and reviewing global activities of a certain supplier.

However, as stated before due to the renewal of the organization, reforming of the supplier development is ongoing. First internally processes need to be defined (i.e. value chain engineering) within the different functions. When functions are internally aligned and mutual understanding has been accomplished concerning the common process, after that the suppliers can be taken along to joint development.

Motivation and rewarding

The most common motivation mean is to promise more business for a well performing supplier since the very same supplier wants to grow and to have better business. Company C is an actor on an extremely attractive industrial segment. Hence, Company C is a very attractive business partner while it is a link to development to automation everywhere in the world. Besides, suppliers are heavily investing on the industrial segment where automation solutions are used. Also, what makes Company C a compelling business partner is the way

it is acting with its suppliers. That is, sharing clear collaboration outcome with transparency and ethical practices.

The main recognition and award is the best supplier of the year which is published on a yearly organized supplier day event. This award is granted based on performance evaluation on traditional KPI. However, when selecting the winner also the ability to drive the development for a better collaboration with Company C is taken into account. Yet, when the new model is set up also rewarding practices should be renewed. Meaning, areas which Company C highly values, such as cooperation and innovation, should be rewarded too.

6.3.5 Lean in Company C

Company C has conducted internal development of plants' operations and some lean principles are already in use. The interviewee stated that Company C's operations are applying lean principles such as automation solution integration, clear responsibilities, efficient communication and emailing, and clarification of the nature of the meetings. This means that the purpose of each meeting is clearly stated (for instance if a meeting is decision making, or communication meeting) in order to be efficient and to eliminate waste (behavioral waste, waste of time). Since there are a lot of cross functional activities in the meetings and information sharing, it is very important to clearly state what the purpose of the meeting is and what will be the expected outcome of the meeting. Process efficiency is important to Company C as well as time management. In addition, continuous improvement is used in operations. Also kaizen tool is in use.

Sources of waste

The interviewee told that as part of the ongoing organization change, also internally a management cycle plan is under renewal. This is related to behavior, process, tools, efficiency of meetings, and how to structure information sharing within area of expertise or within a category. What the processes are which need to be changed to fit this new management cycle and organization. These actions are taking into account waste elimination in order to increase clarity and efficiency.

Also, changes are coming related to external relationships. This means that currently QBR is a reliable tool, but this will change in the coming months to fit better the new organization model and integration of the management model. This is also related to the efficiency increase.

Lean practices in suppliers' operations and with suppliers

The way the Company C sees and is aware of the suppliers' lean status depends on the category and the supplier as those are different compared to each other. Company C's expectation is that the suppliers are following lean principles. As also developing their automation or value chain measurement solution. Suppliers need to have a mindset of efficiency. This is applied especially to strategic suppliers.

Company C is following a continuous improvement principle with its suppliers. In addition, kind of value stream mapping was conducted to a part of the value chain when the aim was to develop and increase the supplier's operations capacity utilization. However, full value stream mapping has not yet been conducted. In the future, the new SD team will contribute also to lean principle adaption with the suppliers.

Benefits of lean in supply management

The interviewee stated that a big benefit lean is bringing is identification of waste and via waste elimination the ability to increase overall efficiency. He sees that the adoption of lean reinforces the new value chain model. As the aim is to have and apply agility, rationalization, simplification, speed, and collaboration alignment. He stated that: *"Trend is that we are really working in value chain that is continuously moving and changing. Lean can help to be more efficient."*

6.4 Company D

Case company D is an international company of the construction business sector. Company D has approximately 8500 suppliers and 500 suppliers of the whole supply base are covering 80% of spend. Actually, Company B is a supplier for Company D. Yet, the value chain can be illustrated with the following figure (Figure 18).

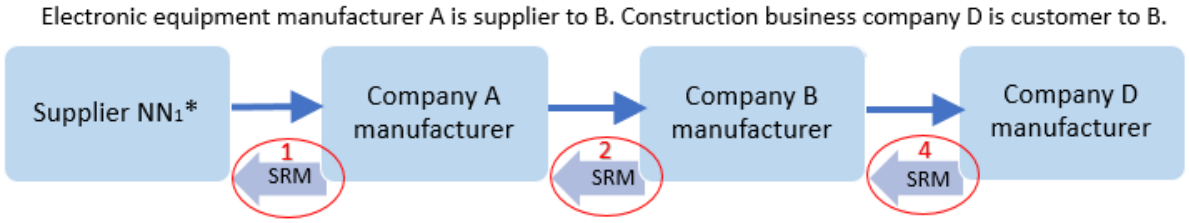

Figure 18: The value chain including Companies A, B and D

Related to this study, two interviews were conducted. The first interview was a pair interview where the informants were the head of procurement and the risk manager. The informant at the second interview was the senior vice president of operational efficiency. Both interviews were face to face interviews.

6.4.1 Supplier relationship management practices in Company D

Procurement has four focus areas which are tightly connected to the company's strategy. These focus areas are: (1) common goals and procedures, (2) cost efficient supply chain and the best solutions, (3) capable people and team spirit, and (4) responsible, capable and innovative suppliers. So, supplier management and supply chain management are in the core focus of a company's business operations.

Company D aims to have responsible, capable and innovative suppliers working with them on the projects. To reach this target the company has developed a framework for supplier management. (1) The first phase in the framework is pre-selection. Pre-selection ensures that the supplier fulfills the company's requirements as well as requirements set by law. The current status is that pre-selection rate is spend wise 85% and quantity wise 55%. (2) The second phase is auditing. Annually approximately 20-30 audits are conducted. Comprehensive supplier audits helps the company to manage supply chain risks. (3) The third phase in the framework is supplier evaluation and development. This has been on

focus starting last year and a lot of effort has been put for development. (4) The fourth phase is cooperation. Cooperation and long-term development are tighter with frame agreement suppliers (which are classified as strategic suppliers) than with project specific suppliers.

Supplier selection and classification

Company D uses certain criteria for supplier pre-qualification. For instance, following topics are covered in pre-qualification: fulfilling legal liabilities; requirements concerning safety at work, environment, logistics, and product; allow Company D to conduct audit; ability to provide country of origin information and traceability of timber, as well as information of chemical content of products; yet, committing to Company D's ethical norms. Prequalified suppliers are rated as world class, approved level, fulfilling Company D's requirements, and fulfilling legal requirements. All new suppliers and subcontractors are required to fill out a preliminary information form. The form includes following categories: company basics, usage of subcontractors, safety, quality, green (i.e. environmental aspects and sustainability), ethics, invoicing, and risk management.

In supplier selection suppliers classification as well as performance evaluation are considered. Procurement systems guide the selection. Four aspects are considered when selecting a supplier: (1) overall economic efficiency, (2) fulfilling social legal liabilities, (3) quality and cooperation, for instance: reclamation rate, spend, safety at work and logistics capability, performance evaluation grades and ability and willingness toward development, and (4) financial status. The biggest suppliers have quality certifications. However, Company D does not obligate a supplier to apply for quality certifications, but instead to provide similar procedure and policy. Also, suppliers are audited in terms of financial situation (i.e. company overview), environment, health and safety, ethical, quality, and production. The main objective for auditing is to secure the adequate level of product, service and capacity. Also, the purpose is to increase the level of collaboration and cooperation and to share good practices.

Reasons that block supplier from selection are for example if a supplier is not willing to commit to Company D's code-of-conduct, deficiencies concerning item's traceability, missing "safety at work" –operating plan or if a supplier is not allowing Company D's to conduct an audit. In addition, factors which block a supplier from selection are weak credit rating, negative legal records and failing on legal liability matters.

Suppliers are classified based on prequalification, legal liability matters, financial status (credit rate) and performance evaluations. Suppliers are classified to classes A, B, C and D. Where A stands for preferred, B approved, C prospect and D prohibited supplier. In order to reach the class A, the supplier should be able to provide competitive prices, supplier spend should be on a certain level and the supplier should have gained adequate amount of performance evaluations with excellent grade.

Processes and tools

Company D has two basic business processes: construction and procurement. Construction is defined as the core process of the company. Operative purchasing process (i.e. project procurement) belongs to this core process. Procurement process is a support process which consists of category planning process and strategic sourcing (i.e. frame agreement procurement) process. Supplier relationship management (supplier management) overlaps both processes: the core process construction and the support process procurement. Supplier management process consists of four sub-processes which are supplier pre-selection, competitive tendering, supplier performance evaluation and supplier development. Figure 19 below illustrates the structure of these processes.

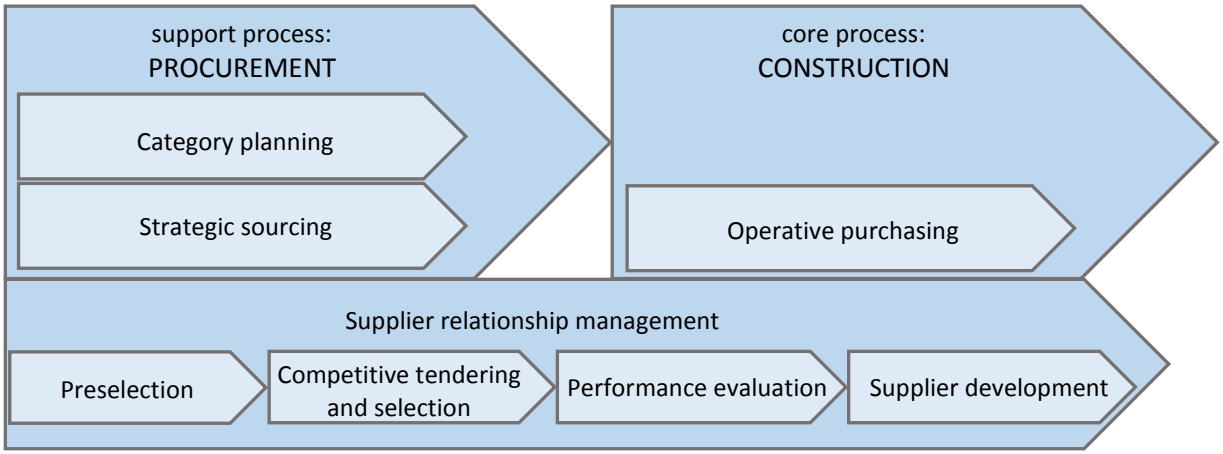

Figure 19: Supply management related processes of the company D

The purpose of the preselection is to ensure that the suppliers have solid financial background and that suppliers' operations are legitimate. Competitive tendering and selection are following Company D's procurement guidelines. This means, that exploiting supplier classifications selections process is leaner and needed inspections and

verifications are minimized. The aim is to indemnify the transparency of the selection and via tenders to achieve competitive prices. Thus, all tenders and selections are performed through procurement systems. Suppliers' performance are evaluated in every project. These evaluations form a base for the needed supplier development actions. Mainly these development actions are focused at critical and strategic suppliers.

The company D has three different systems for procurement. The first is a system for competitive tendering for project procurement. The second system is for catalog buying and the third system is business analytics for order and billing information matching. In addition to these aforementioned procurement tools, also pre-qualification form and escalation process can be considered as tools for procurement.

Benefits and challenges

Company D conducts supplier relationship management in order to manage and mitigate risks. Also, supplier performance monitoring increases transparency, and in addition, enables suppliers' performance improvement (e.g. quality improvements, delivery reliability) and development of suppliers. When suppliers' performance improves the company achieves competitive advantage and gains business benefits (i.e. time and cost savings).

One challenge the company has is related to supplier reduction: the size of the supply base. The supplier quantity is quite big and there is a huge "tale" of suppliers when comparing supplier amount and spend per supplier. The aim is to reduce supply tale but this is challenging while in some cases only some specific local supplier is capable to fulfill a specific need of a certain project.

Responsibility is an important factor in construction business. An ample challenge is to manage the whole supply chain while characteristic for construction business is a supply chain concatenation. Even if the first tier supplier is well managed by the company it is challenging to know how players in upstream supply chain are operating.

In addition to these before mentioned challenges also supplier motivation has been identified as a challenge. Motivation of suppliers for instance toward certain development actions is affected by economy circumstances. If development is requiring some investments or extra resourcing motivation might be challenging.

6.4.2 Collaboration practices and tools in Company D

Supplier management framework emphasizes the importance of cooperation and collaboration. Cooperation is aiming to utilize new innovations in order to increase competitiveness and business. As an example of the importance of cooperation in a big project is a hospital building project where the building technology and engineering has a huge part. As one interviewee stated: "*Company D has deep cooperation with well performing suppliers. On the other hand, if supplier performance is poor company D can use the option to end the business relationship."*

Related to collaboration practices Company D is quarterly sending supplier letters to all suppliers. These letters includes information concerning for instance safety at work, new projects, and changes in Company D's organization.

The main tools for collaboration are email and phone. Company D does not have SharePoint sites with suppliers at the moment but a target is to introduce SharePoint in the near future. Management of networks and collaboration have been identified as future demand, thus a new procurement system is under investigation. Supply chain agility, ability to change and adaptation are essential for business environment, so the key is to share information and collaborate within common platform.

Trust and commitment

The main lever for trust and commitment building is the relationships between counterparties. The interviewees stated that they do not see that trust is built between companies but instead between people. There is lot of regional project based procurement where top management is not involved. While the top management has an important role with the strategic suppliers' relationship management.

An important aspect is that if a supplier fails in some way Company D gives an opportunity to fix the problem. However, if the supplier fails or does not even try to fix the problem, the trust is lost. And conversely, well managed problem situation increases the level of trust and commitment.

Though, openness has been identified to be a challenge. Communication level and collaboration depth is affected by how transparent a relationship is. Hence, transparency is related to trust in the relationship.

Early supplier involvement

Company D has identified the importance of ESI, or ECI (early contractor involvement) as the interviewees call the concept. However, at the moment Company D is missing the persons who should concentrate on this matter. This shortage has been identified and the future goal is to win new business together with a business partner by conducting ECI (early contractor involvement) on a very early state of the project.

Currently frame agreement suppliers are meant to contribute to the projects in early stages. Yet, tight project schedules provide extra challenges which do not allow ECI activities. Also, bidding and achieving a competitive price is the main target.

6.4.3 Supplier performance management and metrics in Company D

Metrics are related to quality, safety and delivery reliability. The supplier management metrics are supplier audit quantity, smart supplier selection (% of spend), supplier preselection rate, supplier performance and innovativeness. Supplier audits are essential for example to ensure safety at work, quality levels and that development actions are ongoing. The purpose of measuring successful supplier selection is to increase spend of the responsible and excellent performing suppliers. Supplier preselection rate increases the number of suppliers fulfilling the requirements. Supplier performance and innovativeness are measured through quantity of development initiatives. The target is to improve and increase the supply chain performance. The main and the most important metric is the supplier performance evaluation feedback given by the worksites.

Also, four more supply management metrics are followed. These are professional procurement personnel, ROI (cost savings and cost reduction over cost of procurement organization), personnel voluntary turnover, and international sourcing (invoicing and orders). Table 16 lists performance metrics of Company D.

Table 16: Performance metrics of Company D

Metric	Unit of measure, definition
supplier audit	quantity
smart supplier selection	% of spend
supplier preselection rate	%, preselection rate
supplier performance and innovativeness	number of development initiatives
professional procurement personnel	percentage
ROI	cost savings and cost reduction over cost of procurement organization
voluntary turnover	rate
international sourcing	invoicing and orders

At the moment the quantity of performance metrics is adequate. Performance is measured quarterly.

Concerning the tools, currently information in procurement system is followed and excel is heavily used for reporting. As stated by one interviewee: "*Performance measurement should be easy and information should come directly from system*." This is not the current status rather performance measurement requires a lot of manual work at the moment. An initiative of acquiring new procurement system has begun. In the future new system should help, in addition to performance monitoring, also collaboration. Also, real-time dashboard reporting is a future target for reporting development.

Performance follow-up and evaluation process

Supplier evaluation is part of Company D's supplier management framework as mentioned in chapter 10.1.The most important evaluation of the suppliers' performance is given by worksites' management, foremen and supervisors. Worksites evaluate the suppliers' performance in the project on multiple aspects. Reviewers also give a statement if a supplier is recommendable for future business cooperation. After analyzing the results the company representatives meet the supplier and provide feedback. Also, based on the results the needed development actions or projects are discussed and started together. In addition, if some deviation is perceived concerning supplier operation, the supplier is responsible for corrective actions. Feedback is provided approximately once a year to the suppliers.

Also, supplier audits can be considered as performance evaluation. Audits improve cooperation and enhance business relationship. Correction of deviations and issues noticed at an earlier audit will be followed and re-audited. In other words, auditing will enable

process development. In addition, quite often suppliers are keen to audits by Company D since the suppliers have noticed that auditing helps them to develop and gain more business with other customers too.

Practices related to managing the suppliers

Audit practice belongs to supplier management framework. Suppliers are audited on six different perspectives: quality, cooperation, safety, environment, effectiveness and economy. Selecting a supplier to the audits depends on the situation: for instance a supplier is audited if some safety risk is identified. Audits belong to the procurement managers' tasks. The company does not have a person concentrating only on the supplier quality topics. The risk management manager is responsible for the entirety of auditing but the procurement manager responsible for the supplier is performing the supplier audit.

Related to cost management, strategic procurement utilizes so called toll gate process where a saving target is set to competitive tendering of the project. Cost reduction targets are not set to specific suppliers but instead to the whole project. The aim is to reach cost reductions through performance improvement and efficiency increase. This is reachable when suppliers are streamlining their operation.

6.4.4 Supplier development practices in Company D

Company D has created a process for supplier development. The process steps are (1) identification of the current stage by analyzing the supply base, (2) providing feedback to a supplier by presenting the overall result of the supplier evaluations and motivating them to further development, (3) performance improvement with jointly agreed actions, such as safety assessment, and (4) performance monitoring. Performance evaluation given by worksites' management, foremen and supervisors is the most important source for identification of deficiencies and a starting point for development actions.

Performance evaluation by worksite, reclamation, occupational accident, or close shave are indications to start the development action. Suppliers are executing development actions initiated by performance evaluations from the worksite management. In addition, the suppliers are unprompted developing their own production and processes. Currently the development actions are reactive and Company D has identified the need for a more

proactive approach concerning development. One interviewee stated that the aim is in the future to set proactively development targets together with a partner supplier.

Company D has also an escalation process which is used in parallel with the development process. If the feedback from supplier performance evaluation is constantly poor and no observable improvement is happening the matter is escalated higher. The supplier is actively informed and feedback is given as well as suggestions concerning the needed development actions. If the matter is escalated high enough and reaching alerting or critical status the top management of procurement can make phase-out –decision.

Success factors and obstacles

Enablers for supplier development are interest, motivating the suppliers, active monitoring, consistency, identification of development objects and potential partners. Also, even though the top management does not participate to everyday practice, it is aware of the ongoing cooperation activities and is sponsoring development actions. In addition, the top management has regular meetings with the strategic suppliers' management.

Supplier development actions are hindered by suppliers' reluctance, randomness of business with the specific supplier, and paucity of resources at Company D's side as well as at the suppliers' side. Due to the scarcity of resources Company D needs to balance its resources and decide to which suppliers it channels its development efforts. Company D does not have supplier quality managers to concentrate on development actions. This means that the procurement manager responsible for the supplier conducts supplier audits and the development actions are belonging to his/hers responsibilities.

Motivation and rewarding

The best performing suppliers are selected in each business area and the suppliers are rewarded. Company D has three different kinds of supplier awards. Safety at work is essential in construction business and terms of agreement includes clause concerning safety at work. Company D rewards the best performers at this area. On the other hand poor performers will face sanctions. Also, related to safety at work and operations' development, the best innovators are rewarded. In addition, a green award related to environmental efficiency is given. Handing of awards happens in subcontractor seminars and subcontractor breakfasts.

6.4.5 Lean in Company D

Company D is utilizing lean methodology and practices even though lean terminology is not used. Performance and operation activities are developed through continuous improvement. The target is to increase efficiency. Also, systematic waste elimination is in use. For instance, eliminating quality defects and faults occurring during material transfer.

Lean starts from the planning. Smart design enables efficient operations from prefabricated element manufacturing to worksite deliveries and to construction operations. Construction is almost totally lean as the construction projects rarely have stocks. All the material deliveries and work phases are supposed to work just in time, otherwise schedules will distract. Inspired by Toyota's utilized methods in automotive industry, Company D has developed method LTT (in Finnish: "*luotettavan tuotannon toimintatapa",* operation mode of reliable production). LTT is Company D's core competence and rest of the actions are built around this method. High risks and low margins are characteristic for construction business. Hence, LTT is an essential part of risk management. LTT is about schedule management. A project has a general schedule which is divided into different phases. All needed aspects are monitored on these phases (for instance. construction site, needed plans, materials and tools) and then weekly planning is conducted. Level of PCC (percentage plan completed) is measured and lessons learned done by asking five why's when analyzing root causes.

Due to aforementioned stockless just in time procedure, supply management is lean-minded. The systematic procedure which is used in supplier preselection, performance evaluation and collaboration enables a lean model or way of working. One example of efficiency improvement is deployment of electrical contract signing. However, internal efficiency improvement is more on focus than jointly improving suppliers operations.

Sources of waste

Interviewees identified several sources of waste, namely, activities which are not adding value and are due to behavior. The biggest waste is due to "*buying same item several times*" meaning that first RFQ is sent to a supplier during rebidding phase (i.e. when Company D is competing on winning a new project with other construction companies). Second time RFQ is sent to a supplier after Company D wins the project. Then, the price is asked third time when frame agreement is accomplished. RFQ could be asked fourth time from the very

same supplier if the supplier is delivering to different projects, while the projects have project specific competitive tendering.

Another recognized source of waste is when procuring small volume as one-time purchase. Here a lot of unnecessary and excess time is used for investigating risk and supplier background. In addition, usually this is an urgent task and executed with less competency. Waste in communication was recognized as the third source of waste. Information amount is enormous. The challenge is to resolve the problem how to ensure that the needed information is available and all relevant people are receiving the specific information. And on the other hand, how to eliminate unnecessary information flood. Yet, the fourth waste source is challenges with schedule coordination between design, procurement and project. For example, how changes and modifications of the plan are affecting to a project schedule and quality.

Lean practices in suppliers' operations and with suppliers

Company D is not systematically following the lean status of its supplier. However, agreements obligate the suppliers and subcontractors to work lean. When auditing suppliers, lean practices may be discussed. Also, when visiting suppliers' production facilities, lean practices can be noticed (for instance 5S utilization in production facilities).

As stated above, Company D obligates its suppliers to perform lean towards Company D. This is shown on worksites where the deliveries by suppliers and work phases should be performed just in time. Projects are so tightly scheduled that misalignment is not acceptable. If delays occur this requires re-planning and scheduling which cause waste of time and money.

Six percentage of suppliers from the supply base are delivering 80 % of spend. Managing and evaluating performance of these strategic suppliers' is on a good level. Preselection is guiding to smart selections. Also, supplier performance evaluations given by worksites' management is essential. These evaluations, and in addition pre-selections, lead to continuous improvement actions. Company D is utilizing A3 lean problem solving method with PDCA (plan, do, check, act) cycle. Also, five why's is used as a part of A3 when identifying the root cause of the problem. These PDCA are conducted together with a supplier. And also, once per quarter the progression of PDCA's is reviewed together with the supplier.

Benefits of lean in supply management

Company D is performing a continuous improvement procedure and waste elimination actions which increase efficiency and reduce non-value adding activities. These lean principles are well adapted. However, Company D could invest in developing a value creation method in the future. This would mean utilization of ESI procedure with its strategic suppliers. Together with its partners Company D could solve problems, innovate and develop new smart solutions for construction business needs in order to be stronger together and win business together. This would require building up rewarding systems for fair rewarding for joint development.

7 COMPARISONS

As described in chapter 5.1 (Research perspectives) this research has four comparisons: one intra-company comparison and three inter-company comparisons. The comparisons are conducted from the buying company's perspective (illustrated in figure 15, page 55). The first comparison, in the following chapter, is the internal comparison between Company A's three different categories (mechanical, electrical and electronics). After this, three inter-company comparisons are conducted where Company A's practices on SRM, supplier collaboration, supplier performance management, supplier development, and lean utilization in supply management are compared to the practices of the case companies B, C and D. In other words, Company A acts as the focal company in this study.

7.1 Internal comparison: Company A

In this research three direct sourcing categories were involved: electronics, electrical and mechanical categories. The category managers from these categories were interviewed and internal comparison of differences and similarities were conducted. A general finding was that majority of the practices in different categories are the same. General guideline, a supply base management model, is followed in the categories. Related to category strategy mechanics category uses a supplier positioning map. First size of the supplier is monitored as well as the price level and capabilities when supplier selection process starts. At the moment there is no need for supplier reduction but instead to increase supplier base.

The mechanics category has developed a supplier relationship management document enabling a more systematic way of acting with suppliers. Mechanics SRM document consists of all the practices, tool and processes which are in use with suppliers. The purpose is to achieve common understanding and transparency in order to be more effective and to gain mutual benefit.

Comparing supplier relationship practices the biggest difference is that the mechanical category has no regular meetings with its suppliers. Seasonal meetings are not arranged at all. Company A's mechanics category has taken into use an interactive SharePoint collaboration for data collection (i.e. a supplier reports its own performance on a weekly basis) and for enabling fast reaction if problems occur in supplier performance. This means that the mechanics category is actively following KPI performance though Power BI

reporting and suppliers report to SharePoint on a weekly basis all late PO lines, deviations in buffers with reasons behind. This information is visible in Power BI report for the mechanics category manager (i.e. general view, where to concentrate and what needs to be done to correct actions and to continuously improve actions). The mechanics category manager stated, that he is concentrating on those suppliers which need more focus. Ratings are conducted in every quarter and the results are sent to the suppliers even though seasonal meetings are not held. However, the mechanics category manager meets all of the suppliers once a year.

Electrical category follows the standard seasonal meeting procedure on agenda and timetable wise. While, the electronics category arranges a meeting on monthly basis with limited agenda. Common shared processes with the suppliers in every category are ECN, reclamation, annual price negotiations, and order delivery process In addition to these, the electronics category has a few more common shared processes with its suppliers compared to other categories. These are request for component approval (RFCA) process and quality processes related to a component final testing (i.e. supplier's final test data from testers are available online to Company A).

Company A's electronics and electrical categories are using SharePoint with the suppliers for action lists, follow-up and tasks' work-flow functionality. The electrical category uses supplier SharePoint sites with task management. This means managing task lists with a supplier with workflow functionality (i.e. transfer the responsibility of a task to the next person). The tasks are for example project development tasks, audit follow-up and production process improvement tasks. Supplier specific SharePoint site is used also to share pricelists and offers of engineering change notices (ECN).

The mechanical category manages specifications with suppliers using SharePoint. Related to component specifications, the mechanical category is handling, sharing and informing its suppliers using SharePoint. The electrical category still uses email for this. Not all suppliers have the SharePoint sites. Email is still the most important tool for information changing and collaboration. In addition, skype-for-business is an important and efficient collaboration tool. Meetings with suppliers, also ad-hoc meetings, are easy to arrange when need occurs. However, the electronics category manager brought up the problem that not all of the suppliers have Skype in use. This is an actual issue: there is no tool for sharing screen in a virtual meeting with some of the electronics category suppliers.

Generally commented, every category follows continuous improvement philosophy when managing the suppliers' performance. Systematical performance follow-up is ensuring that the performance gets better and that problems occurred receive the needed attention. Concerning supplier development practices any major differences were not discovered between the categories. The category manager is responsible for carrying out the suppliers' development actions. Resources contributing to the development actions in addition to the category manager are the buyer and the supplier quality engineer/manager.

Table 17: Company A: internal comparison between categories

Area	Topic	Electronics category	Electrical category	Mechanics category
SRM	SRM document	No	No	Yes
Collaboration	Quarterly seasonal meetings	No - Meetings arranged every month with limited agenda	Yes - 3-4 times per year with strategic suppliers - 1-2 times with non-strategic suppliers	No - Seasonal meetings not arranged
	SharePoint	Task management	Task management, Pricelists, ECN offers	Extensively used: Memos, Documents, Component specifications
	Shared processes	RFCA, Component final testing.		
	Skype	Not able to use skype with some of the suppliers		
Performance management	Power BI reports	Starting to use	Starting to use	In active use

7.2 Comparison of companies A and B

On a company level comparison, the first perspective was to investigate how two companies operating in the same supply chain (i.e. OEM, electronics manufacturing business) practice supplier development. Company A is supplying electronics equipment to Company B. Both companies have comprehensive documented guidelines for SRM execution. Company A follows a corporate guideline called the supply base management model. Company B has a global sourcing operating procedure including all relevant topics related to supplier relationship management practices. A classification model is in use in both of the companies. Company A has four different classification levels and Company B has five. In addition to these five classification levels, Company B has deeper supplier excellence certification (SEC) for suppliers which are classified into a global partner, a global strategic supplier or a unit strategic. Company A has a management mentor procedure in use which means that a representative of Company A's top management has been nominated to the strategic suppliers. The following table 18 lists the differences between companies A and B discovered in this study related to SRM, collaboration, performance management, supplier development and lean.

Table 18: Comparison between companies A and B

Area	Topic	Company A	Company B
SRM	guideline	A supply base management model	A global sourcing operating procedure
	classification	Preferred, approved, conditionally approved, de-source	Global partner, global strategic supplier, unit strategic, validated, selected use
	excellence certification	-	SEC –levels: gold, silver, bronze
	shared processes	Annual price negotiations, ECN, reclamation process, supply order delivery - process	NPCI, claim process, PQP, supply order delivery - process
	procedure/ tool	Management mentors	-
	tool	Seasonal meeting -template	-
Collaboration	meeting	Seasonal meetings	Operative business review meetings
	meeting	Top management meetings, management mentor meetings	Global executive steering meetings
	tools	SharePoint, ASCC, Syncronics	SharePoint, SMP, PDM, SOPM
	ESI	Early stage of ESI - concept	Part of product development
Performance management	evaluations	Quarterly ratings Yearly SPE	Biannually with scorecards
	tool	Rating template	-
	reporting	Power BI reporting	QlikView BI
	meeting	-	Monthly QIT meetings incl. CAPA
Supplier development	roadmap	Development roadmap for selected strategic suppliers	SQM development roadmap in use
	trainings	-	QPO -trainings
	rewarding	Supplier of the year - award	Awards from four different fields
	motivation	-	Suppliers excellence certification
	resources	A category manager with a buyer and a supplier quality manager	SQM organization
Lean	method	Visual management in use internally in SCM	-
	training	-	QPO level three
	tool	-	Mistake proofing
	tool	Internal Kaizen events	Kaizen events with suppliers
	tool	-	VSM with suppliers

When comparing collaboration practices, the first finding was that the main collaboration tools for both companies were email and phone. Both companies have supplier management portals in use. Also, SharePoint sites are used with suppliers when managing tasks or exchanging documentations. In addition, both companies send to its suppliers a so called supplier message/supplier letter on a monthly basis. Both companies identified the role of trust in relationship and top management support as being essential and enabling joint development and commitment.

Related to supplier performance management and evaluations some differences exist. Company A executes two different levels of evaluations: yearly SPE on a global level and quarterly ratings on a local level. Company B conducts scorecard evaluations biannually and in addition, systematic QIT meetings with CAPA follow-up are arranged on a monthly basis. Yet, the companies are using different KPIs. Comparison of KPIs in use is illustrated in table 19. Company A's OTD KPI is similar to Company B's COT. And, Company A's quality KPI DPPM is similar to PFR which is used in Company B.

Table 19: KPI comparison between companies A and B

KPI	Type of KPI	Area of KPI	Company A	Company B
OTD	non-financial	process	Yes	-
COT	non-financial	process	-	Yes
LT	non-financial	process	Yes	-
Late POL's	non-financial	process	Yes	-
RST-S	non-financial	process	-	Yes
RST-NS	non-financial	process	-	Yes
DPPM	non-financial	quality	Yes	-
EFR	non-financial	quality	-	Yes
PFR	non-financial	quality	-	Yes
FYCOR	non-financial	quality	-	Yes
Retrofit caused by supplier	non-financial	quality	-	Yes
Certification coverage	non-financial	quality	-	Yes
Savings	financial	business	Yes	Yes
Cost reduction	financial	business	Yes	-
Payment terms	financial	business	Yes	-

When comparing supplier development practices between the companies A and B, a major difference was noticed when comparing the resources allocated to supplier management. Company B has determinedly invested a lot in supplier development and training. Also, the organization structure is slightly different. Company B has a wide organization concentrating

on supplier development (SQM) which enables consistent and systematic development activities and trainings to its suppliers. While Company A's category manager is responsible for development actions with a buyer and a supplier quality manager/engineer. Also, some differences exist concerning rewarding and motivation. Company A nominates in the yearly organized key suppliers' day the supplier of the year –award winner while Company B hands four different awards from fields: quality, collaboration, value and co-creation.

Related to lean, both companies are utilizing waste reduction and continuous improvement practices. Also, differences were discovered between the companies A and B. Company B organize systematic trainings for its suppliers in order to implement lean practicalities to dyadic relationship. Especially QPO level three training is concentrating on lean practices and tools. In addition, Company B uses a mistake proofing -tool and has also conducted kaizen events with its suppliers. Company A has conducted internal kaizen events but not with its suppliers. Company A is using visual management methods internally in SCM. An interesting difference was noticed related to the suppliers' lean adoption. Company B has discovered that the suppliers' lean adoption level is dependent on the category the supplier belongs to. On the contrary, Company A has not identified the category dependency of lean utilization among its suppliers. Companies A and B were quite unanimous concerning the sources of waste identified in supply management. Table 20 lists these sources of waste.

Table 20: Sources of waste identified by Company A and Company B

Company A	**Company B**
Reclamation process	Claim management
ECN -process	Product change approval process
emails	emails
Inefficiency in supplier development activities	Reporting (manual work)
	Errors in specs
	Forecast vs. order volume (bullwhip)

7.3 Comparison of companies A and C

The second perspective of this comparative multiple case study was to investigate how two companies belonging to the same global corporation but being as separate business units, are executing supplier development and collaboration. The aim was also to find similarities and differences concerning SRM practices, like supplier performance management, and adaption of lean practices in supply management.

When comparing SRM practices between Company C and Company A the overall finding is that the practices are quite the same. Company C has QBR meetings which is comparable to Company A's seasonal meetings. However, a mental difference was discovered concerning the evolution towards value chain partnership. Company C is strongly driving this change while Company A is following traditional KPI driven supply chain partnership management procedure and having QDC (quality, delivery, cost) KPIs in core focus. This mental difference could be explained through different evolution phase or different business nature the companies have. Company C is more strongly outsourcing the sub-product manufacturing than Company A.

Furthermore, Company C recognizes the importance of supplier relationship management in order to execute lean philosophy. Optimizing communication and collaboration on different levels of both organizations, enables reducing of behavioral waste (waste of time) and waste in communication. Yet, related to tools a big difference was discovered on usage of supplier SharePoint sites: Company A utilized these widely but Company C barely uses those. If comparing utilization of the ESI –concept (early supplier involvement in engineering and design) Company C is well ahead compared to Company A. However, product life cycle management is better managed (i.e. more organized) by Company A.

Concerning supplier performance management some differences were discovered related to KPIs, reporting tool, and practices. KPIs both of the companies are using in supply management are listed in table 21 below. Additional KPIs which Company C follows are SOR (speed of resolution) and FFR (field failure rate). While Company A is following lead time. Company A uses Power BI reporting while Company C uses traditional excel reporting. In addition, difference was perceived concerning cost reduction target setting. Here Company A receives cost reduction targets top down. A category manager of Company C sets a cost reduction target concerning his/her own category. Company C also

evaluates cost reduction possibilities first with the suppliers and takes these into account when setting a savings target.

Table 21: KPI comparison between companies A and C

KPI	Perspective of KPI	Type of KPI	Area of KPI	Company A	Company C
OTD	Past performance	non-financial	process	Yes	Yes
LT	Past performance	non-financial	process	Yes	-
SOR	Past performance	non-financial	process	-	Yes
DPPM	Past performance	non-financial	quality	Yes	Yes
FFR	Past performance	non-financial	quality	-	Yes
Savings	Past performance	financial	business	Yes	Yes

Concerning supplier development both companies see that support from top management has an essential role as an enabler for supplier development activities. The supplier development practices between Company A and Company C cannot be compared very deeply at this stage since as a part of Company C's organizational transformation also supplier development team and activities are under construction. When comparing exploitation of lean practices, Company A utilizes visual management tools internally in SCM. On the contrary, Company C does not currently have a visual management (daily management) procedure in standard use at SCM. The following table 22 lists the observed differences between Company A and Company C.

Table 22: Comparison between companies A and C: differences

Area	Topic	Company A	Company C
SRM	Approach	Traditional Supply chain approach	Evolution toward value chain
	Practice	Life cycle management very well managed	Life cycle managed in some level
Collaboration	Practice / tool	Seasonal meetings	QBR meetings
	Tool	Supplier SharePoint sites	No supplier SharePoint sites in use
	ESI	Early stage of ESI -concept	ESI –concept utilized
Performance management	Tool	Power BI reporting in use	Traditional excel reporting in use
	Target setting	Cost reduction targets from top down	Cost reduction targets from category manger
Lean	Practice	Visual management tool in use in SCM	Visual management tool not in use in SCM

7.4 Comparison of companies A and D

The third (3) perspective was to compare practices between an electronics manufacturing company versus a company on the construction business: **A&D.** The general findings of differences between these two companies are listed in table 23 below. Company A uses supplier management portal and SharePoint sites actively in supplier collaboration. Neither of these collaboration tools are in use in Company D. However, a new procurement system is under investigation at the moment and also Company D's aim is to start using SharePoint with its suppliers. Related to collaboration, similarities were identified concerning the regular communication procedure. Company A sends messages to the suppliers on a monthly basis and Company D sends supplier letters quarterly. In addition, both companies have identified the importance of ESI/ECI. Both companies have identified that they could utilize this procedure more and could achieve better results if suppliers/contractors were taken along to the projects in an early phase. However, the interviewees from both of the companies commented that time is challenging to execute ESI/ECI since projects schedules are really tight and at the moment it is not possible to deeper collaboration in an early phase of the projects. If doing so the projects would be delayed. One mental, or conceptual, difference was discovered related to trust: Company A sees that trust in supplier relationship is built on the top management level while Company D sees that trust is built with counterparts working together in the projects. Reason for this is that Company D has lot of regional project based procurement where the top management is not involved. Anyhow, Company D's representative commented that the top management has an essential role when building trust with the company's strategic suppliers.

Table 23: Comparison between companies A and D: differences

Area	Topic	Company A	Company D
Collaboration	Tool / SMP	ASCC in use	No supplier portal in use (under investigation)
	Tool / SharePoint	Supplier SharePoint sites	No supplier SharePoint sites
	ESI	Early stage of ESI -concept	Some level of utilization of ECI –concept
Performance management	KPI reporting cycle	Monthly measurement	Quarterly measurement
	Cost reduction targets	To categories and suppliers	To projects (i.e. toll gate process), not to suppliers
Supplier development	Identification of development need	- performance follow-up - rating results - development road maps	- worksite evaluations - reclamations - occupational accidents - close shave - audits
	evaluation	-Quarterly ratings -yearly SPE	-in every project by a worksite management (approx. once a year)
	rewarding	Supplier of the year -award	Awards from three different fields: safety, innovation, green
Lean	stocks	Safety stock, buffer stocks	No stocks
	practice	JIT not conducted with suppliers	JIT conducted with suppliers
	method		LTT (operation mode of reliable production)
	method		A3 lean problem solving method with PDCA

Lot of differences were discovered related to performance management when comparing companies A and D. Company A executes performance reporting with Power BI and dashboards. Real-time dashboard reporting is a future target for reporting development of Company D. KPIs in use are quite different and also the measuring pace is different. One interviewee of Company D stated that at the moment the company does not have a sensible way to measure delivery accuracy. The reason behind this is that the suppliers are supplying directly to worksites and there is not a proper logging system in use when delivering to worksites. At the moment only some strategic suppliers' delivery accuracy is measured. Even though, this lack of delivery accuracy measurement is not seen problematic. Also, Company A measures its suppliers' performance on monthly basis while Company D measures on quarterly. Also setting cost reduction targets varies due to characteristics of

construction business. This means that Company D's strategic procurement utilizes so called toll gate process where a saving target is set to competitive tendering of the project. Cost reduction targets are not set to specific suppliers but instead to whole project.

Supplier development practices varies between companies A and D. Company D evaluates its suppliers' performance in every project by executing worksite evaluations. Worksite's management is giving grades and these evaluations result in development actions. Also, occupational accidents, close shaves and deviations in audits lead to instant corrective actions and development. Company D rewards its suppliers on three different fields. These are the best performer at safety, the best innovator, and green award which is related to environmental efficiency.

Due to characteristic of construction business, lean philosophy is well adapted. Following lean starts from planning. This means planning and manufacturing clever modules with late variations, and enabling easy assembly at worksites. In addition, construction is almost totally lean as the construction projects rarely have stocks. Company D's requirement is that deliveries by suppliers and work phases should be performed just in time. Company D uses LTT method at its projects. LTT is about schedule management. Furthermore, Company D uses A3 lean problem solving method together with PDCA.

8 CONCLUSIONS AND DISCUSSIONS

The objective of this comparative multiple case study was to form a view of supplier development and collaboration, and utilization of lean philosophy and principles in supply management. This research was executed firstly by investigating the corresponding theory and findings from other researches.

Secondly, by conducting comprehensive empirical research by interviewing the selected companies. The research conducted had three different perspectives, all from the buying company's perspective. The first (1) perspective was to investigate and compare how two companies operating in the same supply chain (i.e. electronics manufacturing business) practice supplier development and collaboration. In addition, how lean principles are utilized in supply management. The second (2) perspective was to investigate and compare how two companies belonging to the same global corporation but being separate business units, are executing supplier development and collaboration, and lean practices. And the third (3) perspective was to compare practices between an electronics manufacturing company and a company in construction business.

Now thirdly, combining the findings from the empirical research with the literature review in order to find the answers to the research questions. The target of this study is to investigate how companies selected to this study conduct supplier collaboration and development, what enablers for and obstacles of supplier development the companies can find, and how these companies exploit lean practices in supply management.

8.1 Responding to research questions

When discussing the importance of collaboration it can be referred to Corsten and Felde's research (2005) where they argue that collaboration improves a company's financial performance and also reduces transaction costs and intensify innovation activities between parties.

The main research question was:

> ***RQ1**: How are companies collaborating with suppliers and how is supplier development conducted?*

As discussed in chapter 3.1 the collaboration between a supplier and a company should be executed by having broad interfaces (collaborative contacts) on different levels of organizations and between the corresponding functions. Communication should have several channels instead of a single point of contact (Barratt, 2004). This enables effective, powerful and real-time collaboration. As an outcome from interviews it can be stated that all the companies that participated in this study are acting accordingly: they have also management level contact points with their key strategic suppliers. Company A has management mentors and top management meetings with the key suppliers to enable tight collaboration and cooperation. Company C has implemented well the cross-functional collaboration with suppliers' counterparts. Company C is monitoring on a regular basis that collaboration partners exist on different organizational levels between the company and its strategic suppliers.

In Company A collaboration is mainly executed by (and via) the supplier responsible category manager and in Company B SQM is daily collaborating with the suppliers. Yet, it was discovered that even though the collaboration methods vary the most used tool by the companies when collaborating with suppliers is email. Also, companies have regular, systematic business review practices (QBR, seasonal/quarterly meetings) in use with their suppliers.

Company A has developed some effective methods concerning performance measurement and collaboration. These are the utilization of Power BI reporting for performance follow-up and created supplier specific SharePoint sites for information sharing (including action lists, follow-up and tasks' work-flow functionality) with the suppliers. The usage of an interactive SharePoint collaboration for data collection (i.e. supplier reports own performance on a weekly basis) enables fast reaction if some problems occur in supplier performance. Likewise, Company B and Company C use SharePoint with its suppliers. An exception here is Company D which is not yet using SharePoint as a collaboration tool with its suppliers. Concerning Company B, reporting and suppliers performance measurement are still quite manually conducted. However, there is a development project ongoing to partly automatize

the reporting. In addition, Companies A, B and C have portals for supplier collaboration. Both the companies A and C are utilizing ASCC –tool for collaboration and information sharing with their suppliers. And Company B has SMP for collaboration with its suppliers. Company D is currently monitoring alternative collaboration tools.

All companies execute supplier evaluations: Company A and C conduct supplier ratings quarterly and SPE yearly. Company B executes scorecard evaluation biannually. Company D monitors suppliers' performance with worksite evaluations. In addition, Company A, B and C are following supplier KPIs on a monthly basis and Company D on a quarterly basis. Also, all companies give recognitions to its well performing suppliers. Company B and C grant several awards to excellently performing suppliers from different fields while Company A and C hand yearly the supplier of the year –award to the best performing supplier.

Supplier development actions can be divided to reactive and strategic processes as discussed in chapter 4.2 (Supplier development processes). In order to be able to conduct strategic actions of the supplier development companies need to first concentrate on the reactive supplier development actions. (Krause et al., 1998) As a general comment, the companies participating this study are mainly conducting reactive supplier development actions. However, the companies conduct strategic supplier development actions instance by flowing continuous improvement philosophy.

Yet, Company B has started strategic supplier development activities when it organizes trainings for its suppliers. The possibility to organize trainings is related to the availability of resources. Hence, adequate resources for development are important. Here Company B has the best situation since the company has SQM –organization in place. Also, initiatives are ongoing to empower suppliers to start to manage more independently their own performance and to develop operations and practices.

Wagner (2006) divides supplier development activities to direct and indirect (chapter4.1, Supplier development activities and practices). It can be stated that companies A and B conduct direct supplier development activities related to human or capital resource. Namely organizing trainings, offering expertize support to supplier's production facilities, investing supplier's tooling and testers. Concerning indirect development activities, it can be stated that all four companies conduct indirect supplier development activities with regular performance management and evaluation processes as well as collaboration practices. The following table 24 lists findings from the empirical research what kind of tools and practices

the companies that participated in this study utilize in supplier collaboration and development.

Table 24: Supplier collaboration and development tools and practices

Supplier collaboration tools and practices	Supplier development tools and practices
email	Supplier evaluations: - Performance rating (quarterly) - Scorecard (biannually) - SPE (yearly) - Supplier KPIs (monthly/quarterly)
Phone	Development road map (proactive, strategic)
Skype	Audits - Process audits - Rapid-plan-assessment
Supplier management portal (ASCC, SMP)	Development topic identification: - evaluations - audits - reclamations - occupational accidents, close shave
SharePoint	Supplier visits - Safety observations - 5S
Supplier message/letter (monthly/quarterly)	Development projects
Follow-up calls and meetings	CAPA, PDCA - root cause analysis - corrective actions
Top management meetings Executive steering meetings	Task force projects (reactive)
Management mentor procedure	Resources - SQM organization - sourcing/procurement manager - supplier quality engineer
Regular communication	Regular and real time feedback
Regular meetings/business reviews - QBR - seasonal meetings - QIT –meetings	Supplier awards and motivation (e.g. suppliers excellence certification)
ESI/ECI	Trainings (proactive)

Companies A, B and C have development road maps. This is proactive, strategic supplier development. However, mainly development topics are identified reactively. This means that the identification of a needed development action or project is originated from the results of performance evaluation, conducted audit, reclamation or safety incident. In addition, the need for development can be noticed when visiting supplier's premises (i.e.

safety observations, level of 5S). All of these four companies reward their excellent performing suppliers.

With the second research question the study aimed to find out the success factors and obstacles which have an influence on supplier development. The second research questions was:

***RQ2**: What are the success factors and obstacles in supplier development?*

All of the companies interviewed in this study recognize the importance of top management involvement as essential for successful supplier development. Also, the mutual trust was identified to be a critical enabler for common development. If management support or trust is missing, the joint development with a supplier is difficult or even impossible. In addition, the adequate resources, both human and financial, were mentioned as success factors. Sufficient resources enable prompt development and also the ability to offer needed training to suppliers. The resources are enablers for strategic development. On the contrary, a lack of resources in a buying company or on a supplier site hinder development actions. Proper communication with collaboration practices enabling information sharing, visibility and transparency are necessary enablers for development. Regular and real time feedback, and prompt communication practices are essential success factors for supplier development. The counterparts should have needed collaboration tools and channels in use. However, related to collaboration there could exist a conflict. Too close relationship could lead to too open information sharing and dependencies. Lack of priority is related to communication and managing the development actions (i.e. resources).

Also, the role of rewarding and motivation were mentioned to be important. Suppliers should receive credit if they are performing well. Motivation, commitment and interest are related together since if a supplier is not committed, motivated or not interested in participating in development actions the reason behind is maybe that the payback is missing or the common goal is not clear enough. If the common goal is not clear to the supplier the root cause leads to collaboration and supplier relationship management (i.e. professional and adequate resources). Right counterparts from both companies should be collaborating together. In addition, if a company has had bad experience earlier when interacting with a certain counterpart this may hamper collaboration. Also, cultural differences create challenges for joint development. Figure 20 below lists the success factors and obstacles in supplier development nominated by companies A, B, C and D.

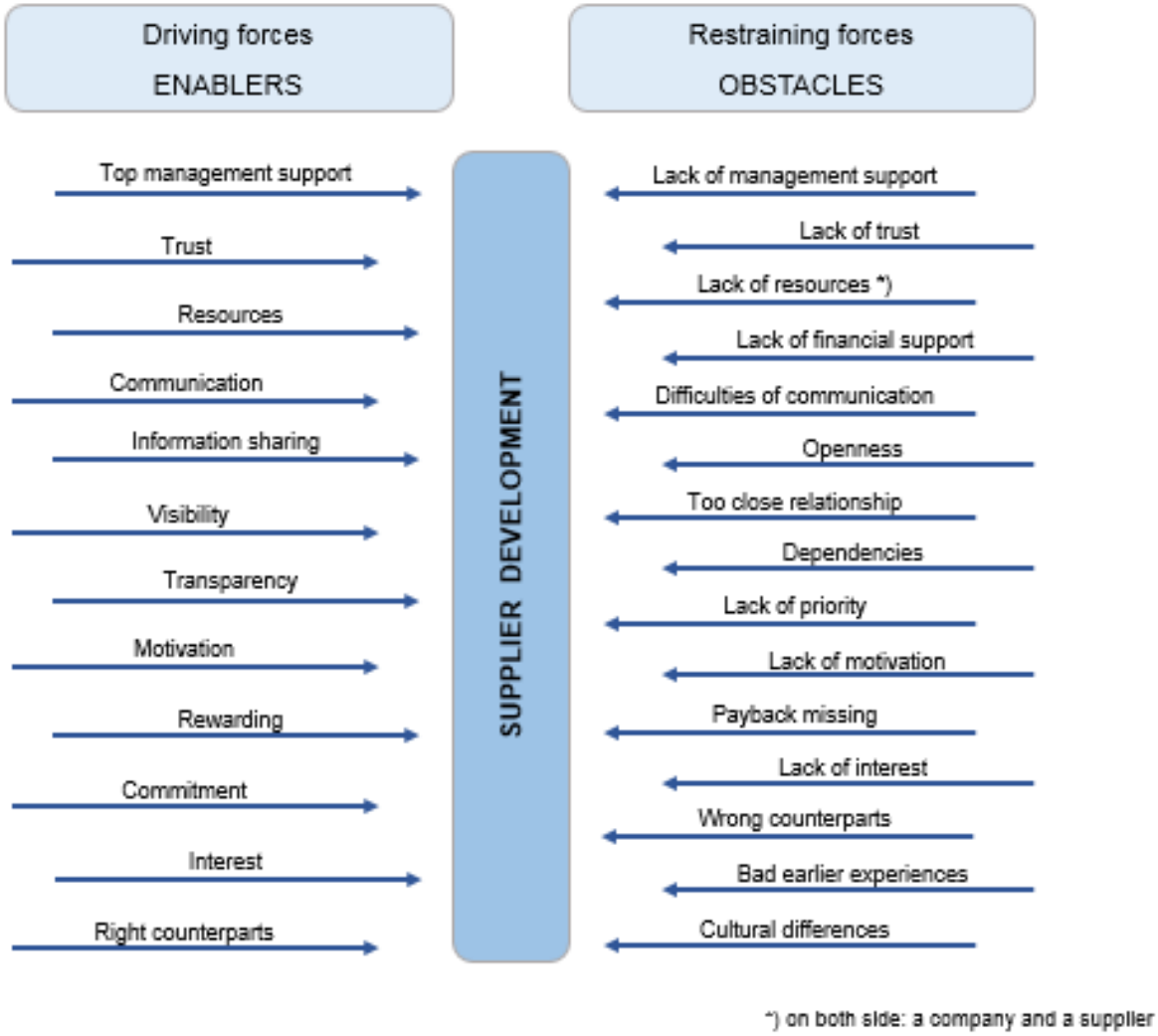

Figure 20: Enablers for and obstacles of supplier development

After these questions the research digs more deeply into lean philosophy and principles. With the third research question the aim is to understand the current position of lean in supply management. The target in this study is also to examine how companies sourcing and procurement perceive the applicability and usefulness of lean philosophy which is traditionally related to manufacturing processes. The third research question was formed as:

***RQ3**: How are companies applying Lean principles in supply management, and in supplier collaboration and development?*

As a general conclusion concerning Companies' A, B, C and D lean adaption is that all these companies utilize some lean principles in supply management even though they are not perhaps aware of some practice or tool belonging to lean philosophy. All companies follow waste reduction principle and execute actions to eliminate waste. Even though, during interviews several non-value adding activities were discovered and processes or practices which generate behavioral waste. These were for instance inefficient ECN and reclamation processes, massive emailing, and excessive and vain tendering process. Sources of waste that the companies identified are listed in the table below (Table 25).

Table 25: Sources of waste

No.	Sources of waste
1	emails
2	Claim management/ Reclamation process
3	ECN -process
4	Product change approval process
5	Reporting (manual work)
6	Errors in specs
7	Inefficiency in supplier development activities
8	Forecast vs. order volume (bullwhip)
9	Inefficient communication
10	Tendering process ("buying same item several times")
11	One-time purchases
12	schedule coordination between design, procurement and project
13	not systematically following the lean status of its supplier

In addition to waste elimination, the companies are executing lean philosophy by following the continuous improvement principle. This principle is widely in use in the own organization as well as in operations with the suppliers. Company A and B have conducted kaizen events. The continuous improvement principle is the most used method in supplier development actions. The companies use problem solving methods and five why's for root cause identification. Jidoka principle is followed by expecting and obligating suppliers to execute 5S practices. Also, Company A has visual tools in use within its own supply management organization. Furthermore, Company B utilizes a mistake proofing practice with its suppliers.

Company A has a daily/weekly management procedure with visual management tools in use within its supply management organization. Also, Company A's collaboration methods are diverse aiming to identify hiccups in supply chain before these cause disturbances in

production. Even though, all companies could improve their collaboration activities with their suppliers. There are often identified delays in communication which generates waste in supply chain.

When comparing the companies' lean status in supply operations, it can be stated that Company D follows lean in the best way while Company D executes just-in-time lean principle in operations with its suppliers. Characteristic of a construction business is that suppliers' deliveries need to be delivered to worksites just-in-time. There are no storage locations to modules and supplies delivered. Company D follows continuous improvement lean principle in supplier development as well.

Concerning lean in supplier development practices, it can be fairly stated that Company B is conducting lean in different ways and the most diversely when compared to the other companies participated in this research. Company B is about to start lean trainings to its suppliers. Actually, Company B has also previously organized lean trainings to its suppliers but now this new QPO level three training package is substantially versatile and heading determinedly towards implementation of lean practices with its suppliers. This procedure aims to increase independency of the suppliers so that they could conduct and manage development activities by themselves by utilizing lean principles and tools. The following figure (Figure 21) illustrates the findings from the companies that participated in this research concerning the influence of lean philosophy and principles in supply management. The figure follows Wagner's (2006) definition where performance management and communication are seen to belong to supplier development activities and to be indirect supplier development activities (see chapter 4.1 Supplier development practices and activities).

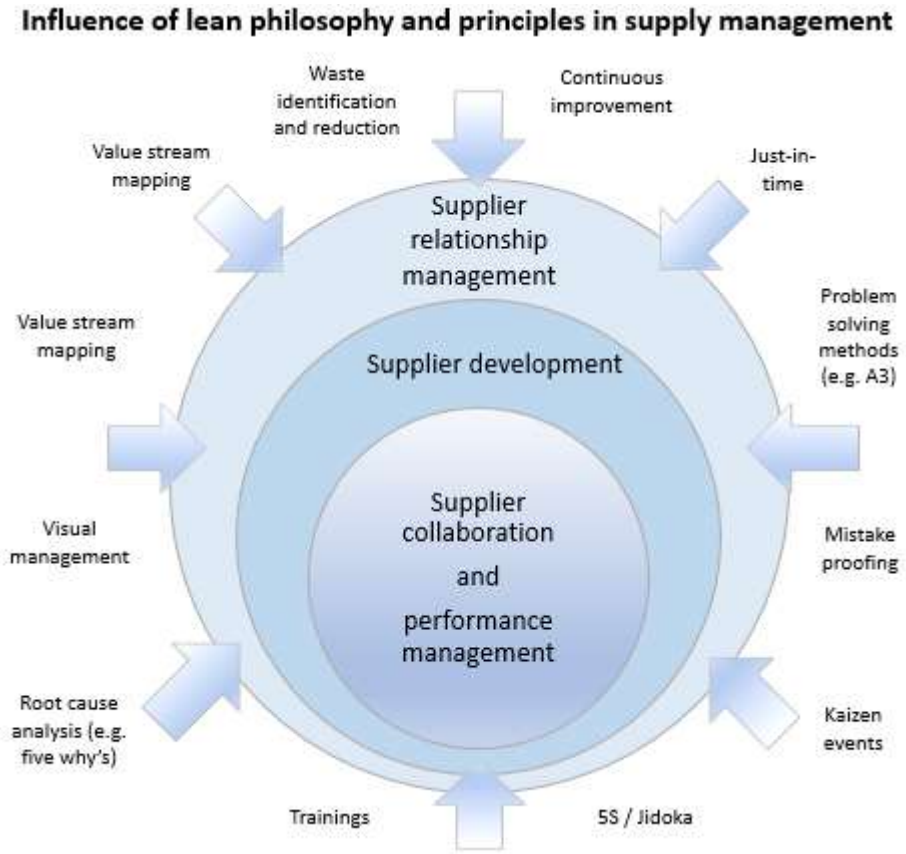

Figure 21: The influence of lean philosophy and principles in supply management

Company C is going towards a value chain organization and to establishing a deeper cooperation with preferred partners. The aim is to build an end to end value chain from second tier suppliers to end customers. The suppliers have an important role within this transformation. With preferred suppliers (i.e. OEM, EMS suppliers) the goal of Company C is to fully integrate suppliers in the value chain. Company C shares same strategy and vision with its suppliers and the target is to work together to achieve this. The value chain starts at an early involvement of a supplier in product design. Under consideration is design, industrialization, product life cycle, full efficiency of supply value chain. All these before mentioned points indicate that supplier relationship management is extremely important for Company C. To keep mutual understanding of targets, strategy, mutual motivation, and mutual follow-up of investment. A supplier choice the company has made is really important since the relationship with a supplier is seen strategically important for the company. Collaboration is in a crucial role and stakeholders need to communicate and collaborate together.

As generally stated, lean is much more than just a box of tools. It is a holistic mindset, philosophy, which is a foundation, a fundament, to all operations. As discussed in chapter 2.3 (Lean thinking and supply chain management), when lean is integrated to upstream supply chain and the supply chain is optimized, suppliers exist near, operations are daily managed with the suppliers, planning is based on tack time and milk runs are running for component delivery. This kind of lean implementation is missing from all the companies that participated in this study. Also, a supplier is only one part of the lean organization. Lean should be adapted in a company level, not only in supply management function.

8.2 Discussions

Wagner (2006) emphasizes that supplier development is a crucial part of the company's supplier management process. Supplier relationship management has become a vital part of a company's strategic approach, meaning that giving more effort to the supplier relationship management, companies can be stronger on the markets. Even though, companies are not too eager to directly invest to supplier development (Wagner, 2006; Monczka et al, 1993). Underestimating suppliers' influence and the role of the company's supply chain can have direct negative influence to the company's success. Strengthening supplier development process, enhancing supplier development practices and actions, and having more tight collaboration, including direct invests (i.e. human resource related and financial resource related) are the key to achieving the competitive edge. (Wagner, 2006). Handfield et al. (2000) argue that ignoring the effectiveness of the supplier performance and if not linking the supply strategy with a company's business strategy, leads underperformance on the supply chain leaving the possible benefits unrealized and the existing potential underutilized.

A strategic supplier development process consists features which are considered to belong under Lean philosophy. As mentioned in chapter 1, according to Helmold (2011) lean thinking is heading to continuous improvement and structured, constant follow up of development. Also, Goldsby and García-Dastugue (2014, 221) argue that the adoption of the lean thinking in a supply chain means utilizing the lean principles and tools in order to align inter-company activities by waste elimination and continuous improvement activities. Following the strategic supplier development process invented by Krause et al. (1998) by identifying development areas and investigating the potential development areas a company is proceeding according to lean philosophy: by doing these actions they contribute

and further assist to identify errors, to eliminate waste and to harmonize processes between different parties, a supplier and a company.

Krause et al. (1998) state that companies have interest on investing on supplier development. When outsourcing activities require companies to concentrate on managing suppliers effectively since a supplier belongs unbrokenly to the company's processes and have direct influence on the company's operations. Despite of this no sufficient, comprehensive research has been conducted in this research area.

Company C is at this moment in the position of changing the business model from a traditional supply chain to a value chain model. Yet, Company C has previously outsourced competencies not belonging to its core competence. Hence, importance of supplier development at this transformation has been noticed.

Continuous improvement and waste elimination are the fundamentals behind the Lean thinking (Goldsby and García-Dastugue, 2014, 221). Also, as mentioned before, crucial for lean thinking is the fact that: what the customer wants (and value), that matters. The company needs to understand the customers' needs. The way to be more aware and focused on this goal is to illustrate the value streams: first inside the company and then taking along the supply chain parties outside the company (i.e. extended value stream (Goldsby and García-Dastugue, 2014, 225)). When value streams are defined, it is easier to start to eliminate the extra unnecessary activities (waste) which are not necessary for a service or a product from a customer point of view. (Hines and Taylor, 2000). Company B has previously conducted value stream mapping internally, but not cooperation with its supplier. However, now Company B is rolling out the QPO training level three to its suppliers. Lean practices and tools are the main content of this training. After the training has been executed, the plan is to conduct VSM with its supplier.

Goldsby and García-Dastugue (2014, 222) state that when a company extend lean thinking outside of the company toward its supplier greater value for the customers could be created. Waste elimination between the inter-company processes is a key for value-adding in the supply chain. The source of waste is often related to the failing coordination between inter-company processes. Also, waste from failing coordination originates from the activities which go beyond and overlap different functions within the company. Concentrating on also internally to sources and root causes of process coordination waste is important. Expanding utilization of lean outside the company's operations to the company's other functions and

also to relationships with the customers and the supplier the ultimate benefits of lean thinking can be achieved. (Goldsby and García-Dastugue, 2014, 237)

A continuous improvement is a part of lean philosophy. Both reactive and strategic supplier development have adopted this idea: companies are concentrating on constantly improving the output of their supply base. Also, waste elimination concerning dyadic processes (i.e. behavioral, communication waste) is crucial in order to gain mutual benefits and achieve competitive advantage on the markets.

8.3 Limitations and suggestions for future research

Several limitations were identified at the beginning of this study. Limitations such as time, the number of case companies, the number of interviews and the number of interviewees (i.e. informants). A case study should include enough cases to be analyzed in order to have validity and reliability (Yin, 2003). Time was challenging in this study. And because time was limited, it was identified that there is a possibility that some selected cases remain unanalyzed or some interviews cannot be accomplished.

Also, another limitation identified in the beginning was that an interview of a company selected to this research fails in some reason. These reasons could be for example if a company refuses to participate or if the researcher realizes that due to time limitation some company needs to be left out from the research. Actually, eventually the interview of Company B's sourcing manager could not be organized. There were several reasons behind, one being time limitation of this study and the other reasons from Company B's side such as sourcing personnel work load and a conflict with the schedules. However, this was not a crucial setback and did not ruin this study while Company B's SQMs are the ones which are in daily contact with suppliers. Sourcing managers are mainly concentrating on price and contract negotiations and seeking new sources of supplies.

Eisenhardt and Graebner (2007) emphasize the appearance of biases in the research. To avoid biases, it is crucial to have enough and competent interviewees who are aware of the research phenomenon. Conducting several analysis units verify the research results and deduct the biases (Dubois and Araujo, 2007). Another identified limitation was the researcher's objectivity while the researcher works for one of the companies participating the study. It was crucial that the researcher maintained her objectivity in this study. Objectivity was carefully observed during the research and while conducting the interviews.

As mentioned above, one limitation of this research is the number of companies selected to this study. For future research the researcher suggests that in order to gain a wider, broader view more companies should be interviewed. A focus of this research was to catch the buying company's view concerning the supplier development and collaboration, and lean philosophy adaption. However, to reach the supplier perspective on the phenomenon under investigation would be interesting. The researcher suggests dyadic research to be conducted in the future. The suppliers' conviction and viewpoint would be valuable to reach the understanding of the depth and level of the relationship, concerning also trust and collaboration. The researcher suggests also for future research a dyadic approach utilizing both a qualitative and a quantitative research methods in order to gain a more comprehensive picture of the supplier development and collaboration conditions and adoption of lean principles. In addition to dyadic approach, it would be interesting to investigate how different counterparts in the same value chain (i.e. several dyadic relationships) are acting concerning lean adoption in development and collaboration. These future research suggestions are illustrated in the figure below (Figure 22) using as an example the companies participated to this study.

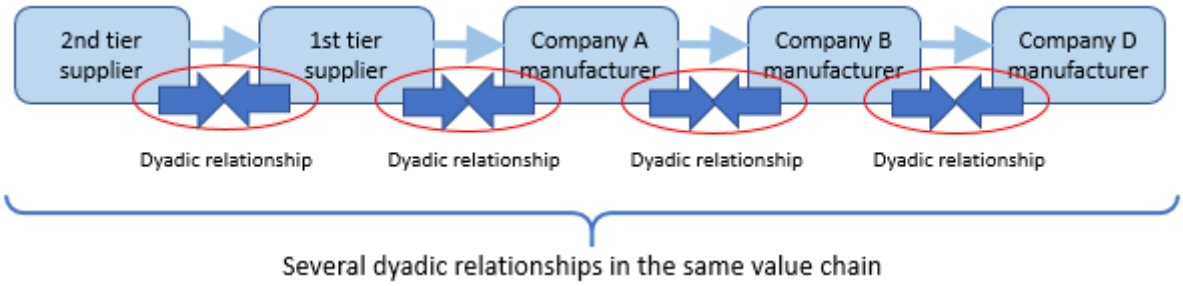

Figure 22: Suggestions for future research approaches

8.4 Managerial implications for Company A

Since the researcher works for Company A these managerial implications are applicable only for Company A. Even though the classification process is defined on corporation level, at this point the company A has not fully implemented the classification process. Classification information has neither been implemented nor informed to the suppliers. Category teams should analyze the supplier base and suppliers' classification levels and in the future the category strategies should include the classification information of the

suppliers. Also, the meaning of different classification levels should be described (i.e. benefits and disadvantages) and how classification influences in supplier relationship management. Communicating to suppliers of the classification is important and what should be done to reach the next level. Classification has “been in mind”, as one interviewee stated, but the process is not consistently described.

Supplier relationship model could be described more formally and officially. This would emphasize that supplier relationship management is an important part of supply management. Clear and transparent model is needed for communicating to suppliers which practices the company has when conducting supplier relationship management, what supplier classification means and, as mentioned above, which practices are related to each classification level.

Also, a new collaboration tool is needed for sharing information instead of or in addition to emailing. With this new tool also collaboration with suppliers would be easier concerning shared processes. As one of the interviewee stated that there is not many processes where the company and the suppliers use the same tool. And that this would be beneficial in the future.

Related to the current ECN process and its waste creating feature of sending ECNs to everyone internally, one solution could be to create category specific ECN email distribution lists. By doing this, only concerned category persons would receive the relevant ECNs. In addition, executing kaizen events concerning both the reclamation process and ECN – process with a supplier would be very useful. This would reveal sources of waste and enable continuous improvement actions. In addition, as a future development idea: conducting kaizen events with suppliers would be beneficial and a value adding act.

Related to suppliers’ motivation the company should more actively market and emphasize the possibility to higher share of spend if a supplier is implementing development actions and demonstrating high-level performance. In addition to motivation, this would also increase commitment and trust between the counterparts.

Also, during the interviews it was recognized that there is an opportunity for developing more systematic development programs/procedure. While, at the moment only selected strategic suppliers have development road maps even though using this kind of procedure would be beneficial with other suppliers as well. Though category managers identify the

needed development actions, those should be communicated distinctly to suppliers. By using clear, accurate procedure and communication model the expectations would be also clearer to suppliers.

Related to suppliers' recognition and rewarding there could exist some other recognitions in addition to the current supplier of the year award. For instance, category specific recognition or rewarding excellent performing suppliers in different sectors. Company A could follow Company B's example of supplier rewarding. Namely, Company B rewards its suppliers on four different fields: quality, collaboration, value and co-creation (see chapter 6.2.4 Supplier development in Company B).

In addition, there is need for a supplier development manager role who should create models consisting procedures, processes and tools for effective supplier development execution. This role should not concentrate on only quality related topics but rather take under scrutiny all features and activities belonging to supplier development operations.

8.5 Reliability and validity

Reliability and validity are important for a case study in order to evaluate the quality of the research. Validity is divided into the construct validity, external validity and internal validity, construct validity and internal validity being the most remarkable for a case study. In order to reach construct validity and reliability, the study should use several informants. (Yin 2003). In this study several interviews were conducted in order to eliminate interview bias (Eisenhardt and Graebner, 2007). However, from Company C only one informant was able to participate in this research. Yet, from companies A, B and D several informants (data triangulation) participated to this study. So, this reinforces the construct validity of this study.

As mentioned in chapter 8.3, time used in this study was identified as a limitation. A characteristic for a multiple case study is that a depth per case may not be sufficient and remains superficial (Voss et al., 2002). This was avoided by a profound interview script and conducting several interviews and interviewing several informants. The same interview script was followed in every interview, interviews were executed in a structured way, interviews were audio recorded which diminish bias and reinforces validity.

Concerning internal validity, it can be stated that while this study being a descriptive case study by its nature, the internal validity is irrelevant in this study (Yin, 2003). Kähkönen (2011) argues that external validity augments if several cases are included into the research. According to Yin (2003) external validity is achieved if findings and results from the research can be generalized. Concerning this study it can be stated that external validity is not important and results cannot be generalized.

The reliability of the research can be weakened by prejudices and bias of the researcher (Hirsjärvi et al., 2016). This was also identified as one of the limitations. In this study the researcher was aware of this pitfall existence. The researcher took a really careful approach and took an objective stand. She relied on the input from the interviewees and left own presumptions to the background and ignored those completely. In addition, conducting several interviews with several interviewees deducts researcher's bias. The aim of this study was to conduct a comparative multiple case study. The findings of the phenomenon under investigation are applicable to the companies involved in this study.

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INTERVIEW SCRIPT

The interview script consists of questions related to supplier relationship management, collaboration, performance management, supplier development and lean.

Supplier relationship management, SRM:

- SRM practices: What kind of practices does the company have for supplier relationship management?
- Supplier selection: How does the company select its suppliers?
    - What are the criteria's to be accepted to become a supplier to the company?
    - Which factors block a supplier from the selection?
- Supplier classification: How are suppliers classified?
    - How is the supplier's classification status shown in practice?
    - How can suppliers reach the next level of the classification?
- Supplier reduction: Supply base reduction practices?
    - Category specific practices on the supplier reduction?
- Processes: What kind of common (shared) processes does the company have with its suppliers?
- Benefits: What kind of benefits does the company gain in the supplier relationships?
- Challenges: What challenges are recognized? Why?
- Tools: Which/what kind of tools does the company utilize in supplier relationship management?

Collaboration:

1. Collaboration practices and tools:
    - What kind of collaboration practices does the company have with its supplier? Daily collaboration, meetings, meeting agendas (including future aspect)?
    - Is there a difference between practices when collaborating with strategic suppliers versus operative suppliers?
    - Collaboration tools?

2. Trust and commitment:
    - Which factors have influence on the level of the collaboration? How?
    - What is the role of trust in collaboration? (How does trust influence collaboration?)
    - Commitment? How is this shown?
3. Early supplier involvement, ESI:
    - How is the concept of early supplier involvement utilized?

Supplier performance management:

1. Performance metrics: What supplier KPIs are in use?
    - What type of metrics does the company use?
        - E.g.: past performance metrics, future perspective / short-term vs. long-term performance metrics / financial, non-financial metrics
2. Tools: Tools used in performance management?
3. Performance follow-up and evaluation process:
    - How is supplier performance management executed?
        - Frequency of monitoring, actions, follow up, future goals?
    - Performance evaluation process? Frequency? Related actions (e.g. result communication with the supplier)?
4. Practices related to managing the suppliers:
    - How are metrics used and utilized in supplier management? For which purposes are performance measurements used?
    - How to identify the cost reduction targets per supplier?
    - How to identify other targets related to e.g. innovation, delivery accuracy etc.?

Supplier development, SD:

1. Success factors and obstacles: Why is the company conducting supplier development activities? Benefits of supplier development?
    - Enablers (success factors) for supplier development? (E.g. top management support, information sharing, certification etc.)
    - Obstacles in supplier development? (Practical difficulties in implementing supplier development activities)
        - What is preventing supplier development?
        - What is slowing down/hindering the development activities?
        - Solutions for these obstacles? How to remove these obstacles?
2. Practices: What kind of supplier development activities does the company have?
    - Processes, tools, activities (e.g. feedback from evaluation, visits etc.)
3. Identification and selection:
    - How to identify and select the suppliers for the development actions? (e.g. strategic supplier position) How to identify the potential of the supplier?
    - How are development areas/topics identified? (e.g.: through metrics (e.g. quality performance); recognized opportunities for joint development in product development projects/new technology; technology roadmaps)
4. Motivation and rewarding:
    - What are the means to get suppliers along and interested into a development topic/project? (e.g. practices for supplier motivation)
    - Does the company have supplier development programs?
    - Company's rewards and recognition to suppliers? How to reward/recognize a supplier who is developing well? What if development or performance is poor?
5. Resources: Resources allocated to supplier development?
    - Who is in charge of SD actions? Is there a team for SD? How is the cross-functional team formed? What kind of roles do the team members have? Top management's role in SD?
6. Development led by the supplier: Is a supplier leading some development actions? (e.g. R&D)

Lean:

1. Are lean principles/practices implemented in the company's operations? In manufacturing? In supply management?
2. Can the company recognize some sources of waste (non-value adding activities) in its supplier relationship management, procedures, processes with its suppliers? (Behavioral waste, waste in communication etc.)
3. How does the company see the status of lean on its suppliers? Are suppliers following lean principles? If yes, how?
4. Does the company follow some lean principle and/or use any lean tools and practices with its supplier? (See: table below) E.g.:
    - Continuous improvement actions?
    - Conducted a value stream mapping with its supplier?
    - Conducted any kaizen events with its supplier?
5. Can you see any value/benefits for adoption of lean principles and practices on supply management?

TABLE: Six most prevailing lean principles and related tool and practices:

Principle	**Tools and practices**
WASTE REDUCTION	Problem solving, value stream mapping, genchi genbutsu (go to where work is done, go and see), five why's (asking five times "Why?" to identify the root cause of defects)
JUST-IN-TIME	Kanban, pull system, one piece/continuous flow, rapid changeover
JIDOKA	5S, visual tools, poka yoke (error proofing), andon (highlight and study the problem)
FIRST-TIME QUALITY	Stable and standardized processes
CONTINUOUS IMPROVEMENT	Kaizen (waste identification and improvement actions from everybody), discipline (avoiding the self-satisfaction and targeting to perfection)
RESPECT FOR PEOPLE	Teamwork, training and learning, safety, shared rewards