

**UNIVERSITY OF VAASA
FACULTY OF TECHNOLOGY
INDUSTRIAL MANAGEMENT**

Lassi Puhtila

**SUPPLY CHAIN COLLABORATION FROM SUPPLIER'S POINT
OF VIEW: A SURVEY FROM EUROPEAN MANUFACTURING
INDUSTRIES**

Master's Thesis in
Industrial Management

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LIST OF ABBREVIATIONS

AHP	Analytical Hierarchy Process
BSC	Balanced Score Card
CPFR	Collaborative Planning Forecasting and Replenishment
EU-28	European Union countries + The UK
EDI	Electronic Data Interchange
EPS	Earning Per Share
IT	Information Technology
ROI	Return on Investment
SC	Supply Chain
SCC	Supply Chain Collaboration
SCI	Supply Chain Integration
SCIS	Supply Chain Information System
SCM	Supply Chain Management
SCOR	Supply Chain Operations Reference Model
SKU	Stock Keeping Unit
SME	Small and Medium-sized Enterprise
OTD	On Time Delivery
USD	United States Dollar

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UNIVERSITY OF VAASA**Faculty of Technology****Author:**

Lassi Puhtila

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Petri Helo

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ABSTRACT:

This research aims to offer some insights what supplier organizations feel about supply chain collaboration. There is a lot of evidence in the previous literature about the benefits of supply chain collaboration. However, there are many potential barriers on why supply chain collaboration fails. In most of the previous literature, supply chain collaboration has been investigated mainly from the customer organization's perspective. Because mutuality of benefits, risks, rewards and information sharing are the foundation of supply chain collaboration relationships, this research studies the phenomenon of supply chain collaboration from supplier organizations point of view.

This research was a survey that was conducted by interviewing 67 different supplier organizations. These organizations were located in three different manufacturing sub-industries inside EU-28 countries. The opinions of these organizations about supply chain collaboration were first studied qualitatively by asking the respondents usage of different collaboration systems and their opinion of using these systems. After this, respondents' opinion on four different barriers was asked by using Likert 5- point scale. This data was analysed later with the help of Kruskal-Wallis test, in order to gain understanding of the distributions of opinions between different departments where respondents were operating. Some respondents also shared their thoughts behind their selected answers, so these opinions are also introduced during the discussion part of the thesis. Because of this, it can be stated that this research used both qualitative and quantitative methods. In other words, this was a triangular research.

The research results display that supplier organizations feel that their customers should be more willing to share risks and rewards with them, and this result was advocated among all the departments. Also, the current state of supply chain collaboration seems to be very complex with all the different systems that supplier organizations need to use with their clients. Generally, the respondents felt that these systems do not benefit them at all. At the end of the research some potential development ideas for solving this dilemma are offered.

KEYWORDS: supply chain collaboration, manufacturing, information sharing, supply chain performance, supply chain management

VAASAN YLIOPISTO**Teknillinen tiedekunta****Tekijä:**

Lassi Puhtila

Tutkielman nimi:

Toimitusketjuyhteistyö toimittajan näkökulmasta: Haastattelututkimus eurooppalaisesta valmistavasta teollisuudesta

Ohjaaja:

Petri Helo

Tutkinto:

Kauppätieteen maisteri

Pääaine:

Tuotantotalous

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TIIVISTELMÄ:

Tämä tutkimus pyrkii ymmärtämään toimittajaorganisaatioiden mielipiteen toimitusketjuyhteistyöstä. Aikaisemmassa kirjallisuudessa on paljon todisteita toimitusketjuyhteistyön hyödyistä. On olemassa kuitenkin monia esteitä onnistuneelle toimitusketjuyhteistyölle. Suurimmassa osassa aiempaa kirjallisuutta aihetta on tutkittu asiakasorganisaatioiden näkökulmasta. Koska hyötyjen, riskien, palkintojen ja tiedon jakamisen molemminpuoleisuus on toimitusketjuyhteistyön perusta, tämä tutkimus tutkii aihetta toimittajaorganisaatioiden näkökulmasta.

Tämä tutkimus oli haastattelututkimus, jossa haastateltiin 67 eri toimittajaorganisaatiota. Nämä organisaatiot sijaitsivat kolmella eri valmistavan teollisuuden toimialalla EU-28 maissa. Organisaatioiden mielipidettä toimitusketjuyhteistyön nykytilasta tutkittiin ensin laadullisesti tiedustelemalla eri menetelmiä, joita toimittajat käyttävät yhteistyössään asiakasorganisaatioidensa kanssa, sekä heidän mielipidettään näiden hyödyllisyydestä heidän organisaatioilleen. Tämän jälkeen vastaajien mielipidettä eri esteistä toimitusketjuyhteistyön onnistumiselle tiedusteltiin Likertin asteikolla. Kyseiset tulokset analysoitiin tämän jälkeen Kruskall-Wallis testillä, jonka tavoitteena oli löytää ymmärrys siitä, vallitseeko eri osastojen välillä missä vastaajat työskentelevät yhteisymmärrys esteistä. Osa vastaajista avasi syitä antamilleen vastauksille, ja näitä syitä käsitellään tarkemmin tutkielman viimeistä edeltävässä kappaleessa. Edellä mainittujen menetelmien takia voidaan todeta, että tämä tutkimus käytti välineinään niin laadullista, kuin määrällistä tutkimusmenetelmää.

Saadut tulokset osoittavat, että toimittajaorganisaatioiden eri osastojen välillä vallitsi yhteisymmärrys siitä, että asiakasorganisaatiot eivät ole halukkaita jakamaan riskejä ja palkintoja tasapuolisesti toimittajaorganisaatioiden kanssa. Toimitusketjuyhteistyön nykytilaa voidaan tulosten mukaan kuvailla monimutkaiseksi, sillä toimittajaorganisaatioilla on käytössään useita eri menetelmiä, joita he käyttävät asiakkaidensa kanssa. Yleinen mielipide näistä eri järjestelmistä on, että ne eivät ole hyödyllisiä nykymuodossaan toimittajaorganisaatioille. Tutkimuksen lopussa esitellään mahdollisia menetelmiä, joilla nykytilannetta voidaan parantaa.

AVAINSANAT: Toimitusketjuyhteistyö, valmistaminen, tiedon jakaminen, toimitusketjun menestys, toimitusketjun hallinta.

1. INTRODUCTION

This chapter opens up the background of the topic of the thesis. In this part also the objective, scope and the structure of the thesis are presented. Finally, some limitations of the research were found, and they are revealed during this section as well.

1.1. Background and objective of the thesis

Manufacturing industry is known from its complex and global supply chains. The modern manufacturing surroundings has advanced a thorough change away from companies encompassing detached hierarchical operations to deeply collaborative virtual networks stretching over a large amount of companies in across the world. Based on the characteristics of this environment, it is vital for organizations to support agile structures, which are qualified to satisfy changing customer needs. In order to achieve the ultimate competitive position, companies progressively prefer to specialize with the focus on their core competencies, while outsourcing their support functions. This leads to construction of convoluted global supply chains that expand the competence from supplier to customer. To succeed in this mission, supply chain management (SCM) pursues to coordinate and combine every action into a single consistent process. (Smith, Watson, Baker & Pokorski 2007.)

Supply chain collaboration (SCC) has emerged as a practice, which helps organizations to control their supply chain and enhance the total competitiveness of supply chain. However, collaboration is a term that can be considered as a relatively spacious term, so it needs to be clarified a bit. SCC has seen a transition to widely adopted supply chain practice from being a completely vague approach. SCC has also raised its reputation across many different industries due to expanded competition and increased popularity of web-based technologies. SCC can be stated as process of decision-making between bilateral units, which engages the parties to share the ownership of decisions and accountability of results. (Wiengarten, Humphreys, Cao, Fynes, McKittrick 2010.)

Sometimes the formed alliances between customer and a supplier fail to succeed. In every lucrative collaborations, collaborative planning has emerged as a vital part of performance of SCs (Ramanathan & Gunasekaran 2014). In addition, a survey made by Fawcett, Magnan & Fawcett (2010) identified inadequate information systems, lack of visible guidelines for governing SC relationships, non-alignment of performance metrics and operating goals, companies' unwillingness to share risks and rewards, and turf conflicts, which hinder process management, as the main barriers towards successful SCC efforts.

1.2. Scope

This thesis focuses on the suppliers' point of view on supply chain collaboration. The published literature and research of this topic spotlights mostly the opinions of customer organizations. In addition, efforts towards SCC are mainly directed to suppliers. A research made by De Leeuw & Fransoo (2009) supports this argument by indicating that close SCC initiatives are mainly pointed out towards suppliers instead of also customers. They also suggest that companies relate to a fact it is easier to set-up initiatives with a supplier than a customer.

Usually SCC-activities include sharing strategic and quality information between the supply chain partners. Shah, Goldstein & Ward (2002) propose that SC procedures such as supply chain integration (SCI) and actions such as forming enduring strategic partnerships with suppliers (SCC), demand comprehensive use of electronic data interchange (EDI) and web-based exchange in addition to support of interorganizational information systems. Therefore, the first research question of this thesis evaluates the different methods that are used by suppliers in their SCC activities:

RQ1: What is the current state of SCC from suppliers' point of view?

The second research question concentrates on the barriers of supply chain collaboration from suppliers' point of view. The barriers were introduced in the previous subchapter,

and the importance of four (*lack of collaborative planning, inadequate and inaccurate information sharing, customers' unwillingness to share risks and rewards, and inconsistent and inadequate performance metrics*) of them was inquired during the interviews that were produced by the author of this thesis. The main goal was to identify if there are some certain barriers that appear as the most dominant barriers for SCC. In addition, this research question was tested with a Kruskal-Wallis test, which analyses the distributions of each department. This was done because this thesis wanted to point out if there are differences among the opinions of the respondents working in four different departments.

RQ2: What is the suppliers' point of view on barriers of SCC?

The research strategy of this thesis is a survey, which contains 67 contacted supplier organizations from three different manufacturing sub-industries. The target segment of these organizations is EU-28 countries (European Union countries and The UK). The contacted respondents were working in four different departments in their respective organizations. The organizations were mostly small- and medium sized enterprises by their revenue.

1.3. The structure of the thesis

This thesis is structured by combining the most relevant findings from the literature and the empirical analysis, which is produced to examine the theories from the literature. Firstly, the chapter number 2 describes the supply chain collaboration and its characteristics from the research literature. In the same chapter, the definition and importance of collaborative planning, information sharing and information quality are explained. Afterwards this, supply chain performance and its metrics are described. Second chapter includes a brief summary of previously explained areas at the end, and then covers the barriers of supply chain collaboration, which are the foundation of this research.

Chapter 3 reveals the research methods and research strategy of this thesis for the empirical part of the thesis. In the same chapter, data collection techniques and the data analysis tests are explained. The next chapter, number 4, opens up the empirical analysis of the thesis. It firstly explains the frequencies and percentages of answers by each question asked. Then a first look into the differences in the opinions between departments is being taken. After this, the research turns its attention to evaluation of the distributions of answers given by each department, which are presented in the chapter number 5. At the end, this thesis offers some development ideas in the “Discussion”-chapter number 6, which is the predecessor of the final chapter number 7. In this final chapter, the whole research is concluded shortly, and the main findings are summarized.

1.4. Research limitations

This research investigates only three sub-industries from manufacturing industry inside EU-28 countries. However, the market size of these industries is quite big, since there are almost 500 000 companies operating in these industries. Thus, it can be noted that the sample size is relatively small. By taking these facts into account, it can be suggested that there is demand for further research, which would consist of a bigger sample size from these industries. This way the margin of error could be decreased. Furthermore, it would be fascinating to see if suppliers’ opinions of barriers of SCC differ in a totally different manufacturing market, like in the Chinese manufacturing industry or in the United States.

If one decides to start investigating this phenomenon of supply chain collaboration and its barriers inside the same market, it could be wise to pay attention to other potential barriers as well. This thesis investigates the respondents’ point of view on just four barriers, when the literature review suggests that there are other ones as well. In addition, it could be convenient to structurize the interviews in another way, for example by comparing the respondents opinion on two barriers at the time while paying attention to the AHP (Analytical Hierachy Process), which does not offer an “easy exit”

for the respondent like the Likert 5-point scale, where the number 3 can be sometimes tempting for the respondent to select.

At the end of this thesis, a phenomenon called Digital Supply Chain is introduced. It is a very interesting area that offers many potential benefits to organizations. The impacts and opportunities of digital supply chain and its technologies for some specific industry could be interesting future research topic.

2. LITERATURE REVIEW

This chapter provides the basic principles of the research topic, supply chain collaboration. The soon to be presented selected literature offers some of the most relevant findings from the area for the reader, who is not familiar with the topic. Since supply chain collaboration takes many dimensions in to account, especially in order to be successful, the main features are opened up. During this chapter, supply chain collaborations share for supply chain performance is also being introduced. After this, the previously presented literature is summarized. Finally at the end of this chapter, barriers of supply chain collaboration are revealed.

2.1. Supply chain collaboration

Maybe the most well-known definition of supply chain collaboration has been stated by Simatupang and Sriradhan (2002): “Supply chain collaboration (SCC) can be defined as two or more independent firms jointly working to align their supply chain processes so as to create value to end customers and stakeholders with greater success than acting alone”.

Companies, which decide to collaborate, shall be aware that risks and rewards should be shared mutually. Barratt (2004) underlines that “collaboration cite mutuality of benefit, rewards and risk sharing together with the exchange of information as the foundation of the collaboration”. He also adds that in order to expand the profitability of SCC, it is needed to identify why to collaborate and around which activities, with who could organization perform these activities with, and what are the aspects of collaboration.

Relationships that are formed by suppliers and customers must have a long-term insight. This is fundamental for SCC, which has been stated as the evolution of intimate, long-lasting partnerships (Cao & Zhang 2010, De Leeuw et al. 2009), where SC partners work as a team and exchange information, resources and risks to achieve shared goals. In 2010s increasing amount of collaborative relationships are being built between

companies. These relationships are being built to achieve efficiencies, flexibility and competitive advantage and they are not purely just about transactions. Collaborative partnerships leverage information exchange and market knowledge establishment for viable competitive advantage. (Cao et al. 2010, Nyaga, Whipple & Lynch 2010, Malhotra, Gosain & El Sawy 2005.)

High integration is a component of successful SCC, where the goal is to achieve total visibility inside the supply chain. De Leeuw et al. (2009) refer highly integrated partnership style relationships as close supply chain collaboration. In these close SCC-relationships planning, demand management and inventory management are made collaboratively. Thus, close cooperation and coordinated activities among business partners, creating visibility, uniting distinct groups within and across companies and sharing of objectives are other features, which are outlining these relationships.

2.1.1 Collaborative advantage

When SC partners operate as if they exist in a single enterprise, they are able to enter and utilize each other's resources and enjoy their combined benefits. When these collaboration activities flourish, and the performance of collaboration partners improves, this phenomenon can be called as collaborative advantage. Cao et al. (2010) state that the collaborative advantage has been ignored by existing literature. The authors describe collaborative advantage as: "a relational view of interorganizational competitive advantage. It comes from relational rent, a common benefit that accrues to collaborative partners through combination, exchange and codevelopment of idiosyncratic resources." Collaborative advantage can be defined as a combined competitive advantage, which spotlights on mutual value creation in bilateral relationship. The collaborative advantage will be gained when SC partners operate together towards shared goals and gain more shared benefits than can be captured by acting on their own. (Cao et al. 2010.)

2.2. Collaborative planning, forecasting and replenishment (CPFR)

One well-known SCC practice is called collaborative planning, forecasting and replenishment (CPFR) (Figure 1). According to Ramanathan et al. (2014) CPFR can be grouped under three levels: basic CPFR, developing CPFR and advanced CPFR. Basic CPFR-classification refers to SC partners, who share a straightforward transactional relationship. In developing CPFR-level the SC partners are able to exchange demand-, order planning-, promotional- and production data. The leading level of these classifications, advanced CPFR, represents the most desirable environment where SC partners will share information transparently. These groupings aim mainly to achieve benefits of multiple elements of SCCs, such as cost reduction, profit, forecast-accuracy and inventory control. (Ramanathan et al. 2014.)

Planning-, forecasting- and replenishment- process are the three extensive sub-processes of CPFR. Every one of these processes includes a number of steps. In first steps, participating companies dedicate themselves to an agenda of demand forecast collaboration, which includes making an accord between every organization about the essential metrics. In step 2, order minimums and multiples, lead times, re-order frequencies and promotions for stock-keeping units (SKUs), which are the foundation of collaboration, are created by item management profiles, which are developed with a mutual plan among SCC partners. Based on the consumption data, partners establish sales forecasts to cornerstones of the mutual business plan (step 3) and collaborate in defining and deciding possible exceptions or variations (eg. forecast inaccuracies, inaccurate inventory levels, execution problems) that need readjustments for the joint sales forecasts (step 4 and 5). Then by merging the sales forecasts, stock strategies, and other information it is feasible to create a certain order forecast that maintains the seller to adjust production capacity against demand while minimising minimum safety stock (step 6). Companies proceed by setting joint-order forecast constraints and collaborate in defining and deciding exceptions, by adjusting new order forecast while paying attention into previously defined constraints (step 8). Finally, the replenishment plan is

established by converting the order forecast into a pledged order (step 9). (Danese 2007.)

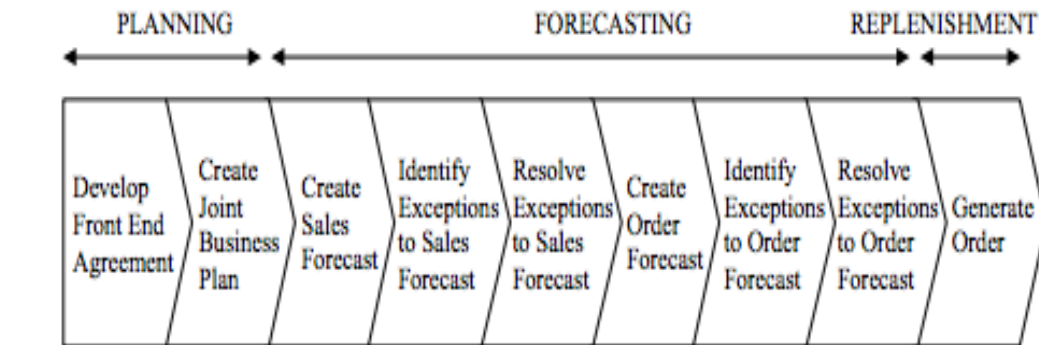


Figure 1. Collaborative planning, forecasting and replenishment (CPFR). (Danese 2007).

2.3. Information sharing

One key element of SCC is information sharing. Successfully formed collaborations are unable to succeed, if information is not shared among supply chain partners. However, researches have outlined the multidimensional essence of SCC that goes further the information sharing. Furthermore, an essential driver for the success of collaborative practices is the quality of shared information between supply chain partners. (Wiengarten et al. 2010.)

Nowadays organizations overburden with increasing amount of available information to conclude with. Organizations are buried with information from the Internet, from the raising dependency on e-mail, and the variety of different organizational systems, which generate plentiful management reports. The issues and problems that these reports are underlining are frequently ignored. Often organizations do not trust in information based on its accuracy or reliability. This result weak decision making, in terms of

applicability, or reliance on other internal information, which accuracy could be hard to prove. (Barratt 2004.)

In collaborative SCs, information sharing is credited as a highly essential function for firms to weaken the bullwhip effect and also to perform collaborative forecasting. When information sharing is in the center of collaborations, it is vital to perceive that every types of companies who especially are included in SCC pay attention to collaborative planning, which targets for enhancing the visibility among upstream and downstream associates of SCs. (Ramanathan et al. 2014.)

Information sharing related to supply chains refers to the fact on which shared information is crucial and/or legit to partners of the SC. Exchanged information can be classified as tactical (related to purchasing, operations scheduling, logistics) or strategic (such as long-term corporate objectives, marketing and customer information). The extent to which information is exchanged can result to new scenarios where companies are able to collaborate to diminish supply chain inefficiencies, which has a huge effect on the customer-supplier relationships. When companies are able to access into significant information among the supply chain, it can result alternative possibilities. Increased information visibility in supply chain can help companies to modify their current actions or organize future operations. (Hsu, Kannan, Tan & Leong 2008.)

2.3.1. Information quality

Information sharing is maybe the most important part of the SCC. However, the information that is shared among the SC needs to be valuable for SC partners. Malhotra et al. (2005) evaluated the intermediating role of information quality among information sharing, knowledge creation and operational efficiency. In their research, they defined several types of SC partnerships, which have the potential to capture high operational efficiency and knowledge creation. Companies in this cluster have the tendency of exchanging a variety of high quality strategic information. Wiengarten et al. (2010) also

conclude that: “since information plays important part in collaborative supply chains, its quality might also be a vital importance for the success of collaborative supply chains”.

Supply chain partners that aim to share information successfully need suitable systems for this. Shah et al. (2002) argue that: “supply chains at different levels of integration and coordination require different levels of technology integration.” They suggest in their framework that a high level of SCI must be equivalent with high level of IT integration in order to capture exceptional SC performance and vice versa. Orunfleh & Tarafdar (2014) found evidence supporting the previous argument, stating that the use of integrated information technologies and IT integration capabilities facilitate the SC coordination and integration. According to the authors, this leads to improved firm performance.

Denolf, Trienekens, Wognum, van der Vorst & Omta (2015) argue that SCs need more increasingly to adopt and apply information systems for improving coordination and integration. These supply chain information systems (SCIS) back information sharing and storage by automatically contributing applicable information to the SC associates. According to them, success of a company is dependent on its ability to collaborate and integrate with its SC associates. Due to this, companies need to transform the limits of their traditional internal systems and must focus on pursuing to implement SCIS. Implementing these cross-company systems, however, is complicated due to three SC characteristics:

1. Scope of the SC refers to number of members in SCs. The more members in SC, the more coordination is needed to improve operational efficiency of the SC.
2. Organization of the SC represents the way relationships between members are built and coordinated. There is more trust involved in long-term partnerships, and these partnerships are coordinated through written contracts. Power-relationships may also affect the organizational structure in SCs, where one or

two leaders are steering and driving the structure and management of SC organization.

3. Technical capabilities, operational practices, attitudes, culture, management techniques etc. may vary among the members of SCs. Having differences in these factors may deepen the complexity of SC. (Denolf et al. 2015.)

Development of supply chain is heavily impacted by information, especially the transparency and quality of information flows. However, these impacts may be negative. Especially intermediation of information is a potential obstacle to outstanding transparency in SC due to it is a origin of asymmetric information. Intermediation also inevitably increases costs and often establishes a non-value adding activity into SC (Barratt 2004).

2.4. Supply chain performance

Supply chain performance can be stated as the efficiency, which rules in several performance measures related to partners of SC in addition to the integration and coordination of performance of the members. In manufacturing industry, external-internal connection between companies and their SC promotes rearranging their manufacturing systems precisely when it is time to fit the necessities saturated by market and/or suppliers and/or manufacturing requirements. (Al-Shboul, Barber, Garza-Reyes, Kumar, Abdi 2017.)

Chopra & Meindl (2013: 53-54, 63-66) introduce six major supply chain performance drivers. Facilities, inventory, transportation, information, sourcing & pricing represent these drivers of SC performance. The main trade-off for these drivers is usually defined with supply chain efficiency versus supply chain responsibility. However, information is the only one of these major drivers that can have a significant positive impact to both supply chain responsiveness and efficiency by using all the available information and analysis of data in the supply chain. It also has direct impact towards all the other

drivers and participants of supply chains. This leads to the overall trade-off in information, which can be defined as the complexity of information versus its value. Trade-off can be interpreted as the supply chains ability to get value out of the information, to the extent on how complex or convenient it is to gather.

Supply chain performance can be measured with financial and non-financial measures. Financial measures are important to evaluate whether operational adjustments are improving the financial state of an organization but are ineffective to measure SC performance. (Wu, Chuang, Hsu 2012)

One famous performance measurement framework is the balanced scorecard (BSC, Figure 2.), which was firstly introduced by Kaplan and Norton in 1991. The reason behind developing BSC was according to the authors that classical financial accounting metrics such as ROI (return on investment) and EPS (earning per share) underlined incompletely the state of business performance and could mislead continuous improvement and innovation. Due to these facts they argued that assesment criteria should include non-financial aspects like customer, internal process and learning and growth. (Wu & Chang 2011.)

Wu et al. (2011) adapted the BSC to specify supply chain performance, which aims to connect the performance framework to four BSC-based aspects. Organization and human capital, supply chain improvement, customer relationship, and profitability and revenue are included in this adaption. Non-financial measures are represented by the preceding three perspectives, while the latter perspective expresses a financial measure.

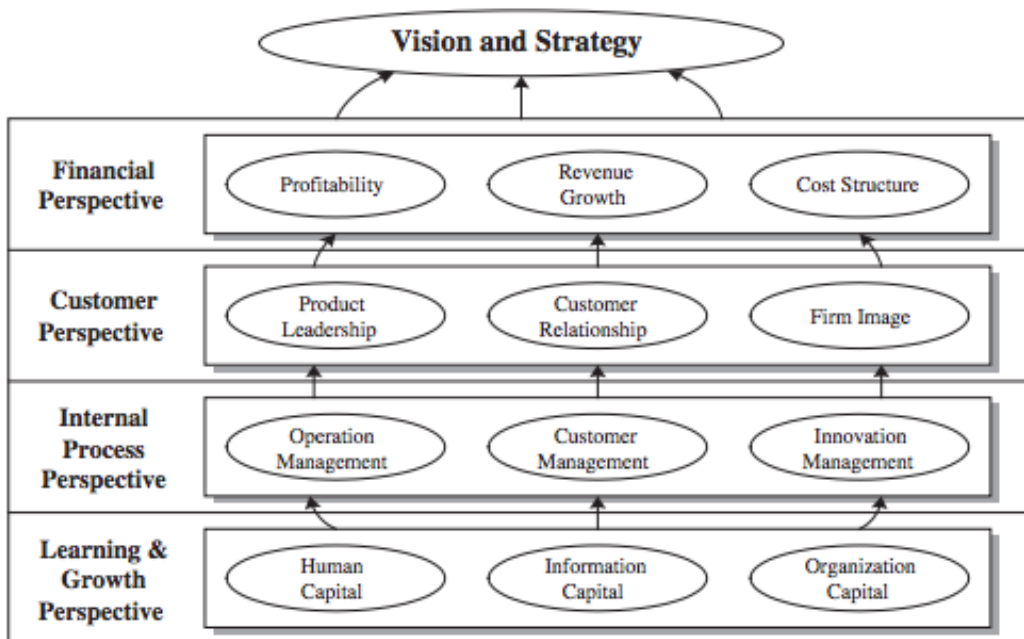


Figure 2. Strategic framework of BSC. (Wu & Chang 2011)

2.4.1. Supply chain collaboration linked to supply chain performance

SCC should clearly influence the performance of SCs by creating and valuing more attractive partnerships among the supply chain. This, however, is not always completely true. There are some crucial elements that need to be taken into account, if performance is wanted to enhance through SCCs. Sanders (2007) recognized that while intra-firm collaboration has resulted a direct influence on performance, inter-collaboration looks to do so just by indirect ways, through intra-organizational collaboration. Cao & Zhang (2010) also point out the importance of planning activities, integrating cross functional-processes, coordinating the supply chain, setting supply chain goals and establishing information sharing parameters as a core factors for accomplishing goals that are set up collaboratively by supply chain partners.

The relationship between key perspectives of SCC (planning, execution and decision making) and lucrateness of collaboration is powerfully linked to one another. Even though these factors are drivers for the success of collaboration, not every one of them is affecting the SC associates to be part of lasting SCC alliances. Between all the four

elements, just the success of SCC and execution of SC processes are encouraging and inducing the SC partners for forthcoming collaborations. Rewarding SCCs with content partners will guide them to progress with their forthcoming partnerships. SC partners determine the scope of information sharing and future collaborations due to the success of current collaborative arrangements. This can also ease them to agree the contributions in SCCs, such as investments in IT and communications. (Ramanathan et al. 2014.)

Identifying that SCs, which exchange information for coordinated decision-making gain maximum efficiency for all associates, a precise approach to SCM, which underlines collaboration across departments and between companies, has developed. When the requirement for collaboration grows, the requirement for integration and the capability to handle substantial amount of informations exchanged among affiliates grows too. IT has evevolved into an indispensable part of SCC and performance enhancement to capture, process, analyse, store and share significant amounts of information over extensive geographic ranges in an appropriate manner. (Smith et al. 2007)

Daugherty, Richey, Roath, Soonhong, Chen, Arndt & Genchev (2006) reported in their study that performance linked with the companies' most crucial collaborative associates is spectacular, and it is extremely probable that these companies are enhancing operational performance by concentrating on service quality. Intimate collaborative affairs permit them to concentrate on their SCC associate preferences, which creates more tailor-made service in the process. Extremely high achievements with respect to enhanced information visibility, service levels, and end-customer satisfaction based on the collaborative affairs was reported by the companies that participated in the study.

2.4.2. Supply chain operations reference model (SCOR)

Performance of the SC can be measured in many ways. One well-known model for measuring the performance of SCs is the SCOR (Supply Chain Operations Reference)

model (Figure 3.), established by Supply Chain Council in 1996. According to Liu, Huang, Mokasdar, Zhou & Hou (2014) “it is a reference model, which can be used as a tool to map, benchmark and develop the operations of supply chain.” Fundamentally, the SCOR model is commonly applied by manufacturing organizations to specify their SC processes and activities, and related performance metrics (Li, Su & Chen 2011).

The main goal behind developing SCOR is to provide a standard framework, which helps large corporations to evaluate and estimate their divergent SC activities. The framework consists of a group of evaluation metrics and offers a mix of business processes, technology and best ways for efficient sharing of materials and information among different stages of the SC. Five distinct management processes; PLAN, SOURCE, MAKE, DELIVER and RETURN are used for communicating between supply chain partners. Based on these expressions, three levels of process details are provided by SCOR. Every level of detail helps companies by determining the scope (level 1), configuration or type of supply chain (level 2), and process feature details, which include performance metrics (level 3). After assessment of three levels of process details, last level of the model is dedicated to implementation of explicit SCM practices. These practices are used for achieving competitive advantage and adapting in modifying business environments. (Liu et al. 2014.)

Fig. 1 The SCOR model
(SCOR 80 2007)

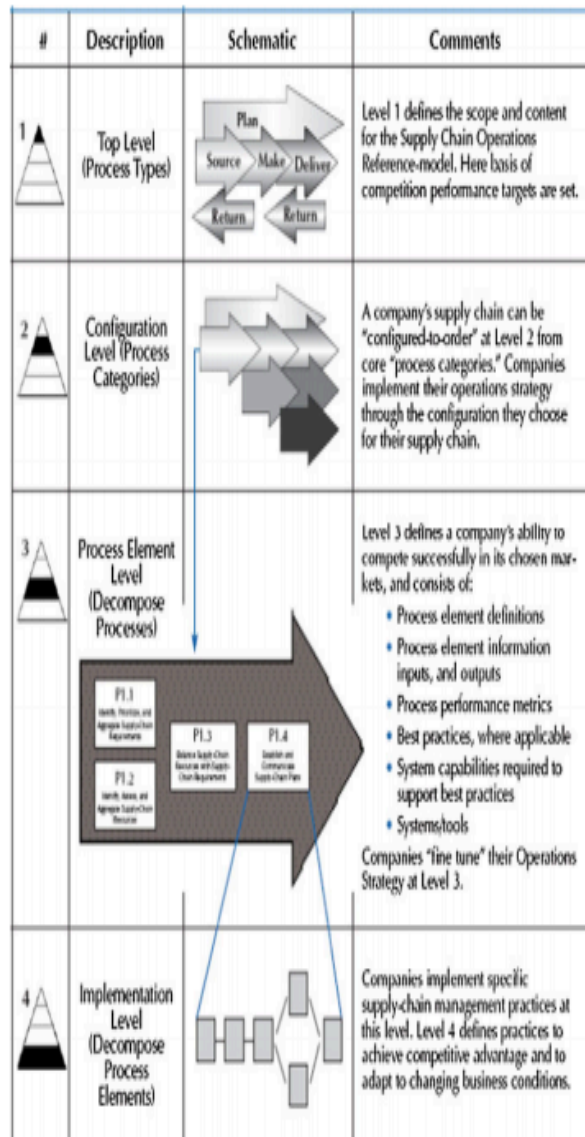


Figure 3. The SCOR-model (Clivillé & Berrah 2012).

SCOR model is a beneficial model for companies. With the help of SCOR, companies are able to examine and evaluate their SC processes, define if unsteady link exists in supply chain, and identify possible improvements. The position of SCOR is achieving more noteworthy status due to its ability to propose a practical proposal to define SC process outcomes and performance metrics, which is nowadays attractive for companies that are paying higher attention on SC performance. (Liu et al. 2014.)

2.4.3 Supply chain performance metrics

Supply chain performance can be assessed by using different kind of metrics. Gunasekaran, Patel & McGaughey (2004) studied the importance of several performance metrics. According to their results, they found out that highly important performance metrics were customer query time (order planning metrics), supplier delivery performance (supplier metrics), percentage of defects, cost per operating hour & capacity utilization (production metrics), quality of delivered goods, on time delivery for goods, and flexibility of service systems to meet customer needs (delivery performance metrics). Authors suggest that a performance measurement program for a SC should be thorough and influential factors of performance in any link are not neglected. Every set of performance metrics is not suitable for all of the supply chains. Performance measurement program must be tailored by the needs of its members in a way that cross-functional, intra-organizational process planning & -control and more thorough supply chain integration will be captured by a good SCM program. This needs to be captivated by a supply chain widely, which can be achieved by collaboratively planning, coordinating and aligning performance measurement actions, which all participants can commit in. (Gunasekaran et al. 2004.)

Barratt (2004) identifies some threats in development of supply chain metrics. He argues that most of supply chain metrics can be regarded inappropriate for the SC as a whole. They become profitable, when they are shared between customers and suppliers, so bottlenecks in the SC (in the basis of inventory stockpiles and process inconsistencies) can be defined and total performance enhanced. The major barriers to developing such SC metrics, according to Barratt, are the complexity of overlapping SCs and the information exchange among companies. Unless the most suitable SC metrics cannot be elaborated, the several elements of SC will proceed to operate in diverse ways and the whole SC will not be united.

2.5. Summary of literature review

At this point, this thesis has pointed out how supply chain collaboration is a valuable practice for companies that want to increase their SC performance. In addition, it has also been stated very clearly how information sharing and increased supply chain performance through SCC are linked together. This chapter summarizes the main findings so far. Further, barriers for successful SCC are being introduced.

According to the findings of Cao et al. (2010) collaborative advantage and better performance of company is gained through SCC. The relationship is a signal that, in order for SC as whole to perform greatly, companies should try to create a win-win environment where all participants collaborate to gain business synergy and compete with other SCs. Generally, these competitive expectations influence individual companies to promote their own interest over others and it will end up as expense for others. This is very treacherous for collaboration and it will have a bad influence on the relationships. In enduring relationships, such as SCC, mutuality of intent, mutual alignment of goals, and sharing of benefits have to be motivated by the managers for creating collaborative advantage. This kind of collaborative advantage increases the financial performance for each member of the SC directly. (Cao et al. 2010.)

Development in IT has generated integrating information flows in the supply chain realizable, which positions IT as a essential driver of SCC. Due to SCs reliance on IT, it can be argued that it is infeasible to obtain an effective, competitive and collaborative SC without IT. (Smith et al. 2007.)

Daugherty et al. (2006) address the significance of formalization. They describe formalization as a degree, which defines how structured things are. They add that: “high formalization is signal that decisions and working relationships are influenced for an extended period of time by formal rules, standardized policies and operating procedures. Formalization of strategic collaboration establishes expectations of what should be done and sets up standard practices. These highly formalized relationship may present the

level of information sharing, define the type of information that is exchanged, create a framework for joint planning, implementation and control, and basically define the contractual terms of relationship. These agreements are anticipated to create a long-term stream of financial improvements for all firms linked across the supply chain. Formalization of strategic collaboration can lead to improved performance by eliminating uncertainty and clarifying priorities by securing focus and saving time.” It can also accelerate business operations and ease ensuring that things run smoothly, which can affect positively on inter-organizational affairs and managing cross-organizational assets. (Daugherty et al. 2006.)

The study made by Nyaga et al. (2010) resulted that suppliers are more committed on affairs with buyers who are sharing information, because information exchange eases the suppliers to contribute products or services more efficiently and effectively. Information sharing from buyers’ side also reflects to their commitment to the supplier, and it encourages the supplier to engage to the relationship. Study also pointed out that joint affair efforts influence trust dissimilarly among buyers and suppliers. Suppliers seem to have a greater effect on joint relationship efforts. It is anticipated that suppliers will be more trusting in an affair where buyers take part in joint planning, setting goals, measuring performance and problem solving. Suppliers possibly look at buyers as mindful of their welfare and dedication to partnership. This administers an environment for suppliers to open up on their needs, concerns and expectations in the relationship. These joint efforts result that buyers are to address issues raised by suppliers to ever-increasing degree, which may further improve the trust of supplier.

2.6. Barriers of supply chain collaboration

When SC participants chase their own goals or information movement between stages is delayed and misinterpreted, collaboration diminishes. Each stage of a SC has a different owner and as a result dissimilar stages could have clashing goals. If each activity is viewed locally by members and the impacts of it actions on other members is not

visible, the whole SC suffers because the total benefit is shinked. (Cao, Vonderembse, Zhang & Ragu-Nathan 2010.)

Nyaga et al. (2010) examined supply chain relationships in their research. They evaluated if supplier and buyer perspectives differ on collaborative relationships. Many companies are battling to reach the desired level of collaboration or expected gains from collaboration. This is mainly due that selecting correct partner, matching inter-organizational needs and capabilities, distinctly determining standards and goals are usually ignored. Due to these critical aspects many collaborative actions have failed.

SC performance is estimated in overclarified and occasionally counterproductive (cost-reduction-based) means in supply chains. When the performance is measured cost-centrally, the individual costs are maximized, and end-customer value is not maximized. When local performance measures are limited, supply chain does not work in connected manner. When performance measurements are being integrated, supply chains should focus on the big picture, which includes all the participants of the SC, instead of individual ones. In this scenario, it is also very likely that there is asymmetric information involved in the supply chain. This refers to dissimilar members having separate quality of information about demand conditions, products and SC activities. SC members generally do not want to exchange their own data entirely and conscientiously, because the information can have some substantial economic value. This leads to the situation where the whole SC bears from sub-optimal decisions and opportunistic behavior. Sub-optimal decisions take place when the participants do not have the required visibility to settle several trade-offs in decision making due to lack of information enables decision-making in a limited scope that cannot verify the according product-flow to ultimate customer. Further, with bounded information exchange, participants do not have subsistent picture of market requirements and visibility over performance at the other stages of SC. (Simatupang et al. 2002.)

Fawcett Magnan, McCarter (2008) underline in their study findings that “people are the key to successful collaborative innovations. Companies continue to invest in

technology, information, and measurement systems. However, managers must not overlook the training, educating, and bringing together the right people to use those systems and to interact with one another. By designing the right teams for the right tasks will then lead in well-defined pilot projects and success stories that will help create buy-in from other organizations members and thus increase their commitment to SC collaboration.” Hsu et al. (2008) add that managers must be committed to guide their organizations information exchange capacities to advocate lucrative affairs with suppliers. In order to succeed in this, it is essential to understand linkages across buyer-supplier relationships, and the strong correlation of its antecedents (such as information sharing) and results (firm performance).

Fawcett et al. (2008) explain in their research that every manager recognizes technology, information, and measurement systems as crucial barriers to successful SCC. Nevertheless, the people matters – such as culture, trust, resistance to change, and willingness to co-operate – appear more difficult. This could be explained by potential misalignments in technology, e.g. either system A aligns with system B or it does not. Dilemmas with different metrics are also common, and this can be simply tackled with usage of same metrics. Nevertheless, when human barriers are in question – such as lack of trust, unwillingness to relinquish control, and opportunism – Fawcett et al. (2008) add that: “solutions become more of a judgment call rather than an unsolved problem. Managers should not overlook this point when designing remedies to SC problems such as organizational culture and structure, and management styles”

In the study made by Daugherty et al. (2006) panel participants were inquired about the one collaborative relationship they relied to be most significant to their organizations’ future success. According to their study “strategic issues such as sharing supply and demand forecasts, or cost information are not as important as setting up the basic day-to-day framework for the relationship.” There might be two reasons for this. Firstly, companies may be reluctant exchange of strategic information because of the associated narrow maturity of the collaborative relationship. Partnerships formed by the companies may be at an earlier level and therefore have not acquired a level of collaboration

equipped with powerful trust and lasting commitment. In time, these companies might share increasingly strategic information, but are at this stage content with the tactical day-to-day benefits of exchanging operational figures. Second, the purpose of companies is ultimately to make money. Respondents in their study might have felt that their companies possess information-related competitive advantage that needs to be protected for maintaining a strong position in their industries, and when strategic information is revealed, such as internal forecasting and cost-related information, it might place the company in a difficult position due to great risks. Protecting the information might stay in front of the potential of strategic-level collaboration due to these scenarios. (Daugherty et al. 2006.)

3. RESEARCH METHODS

This thesis is a descriptive research, which aims to explain the current state of supply chain collaboration from supplier organization's point of view. The reason behind selecting this theme as the research topic was that previous research is mainly examining the supply chain collaboration from customer organizations point of view. Therefore, the author of this thesis decided to examine the topic from another side of the relationship.

The target segment of this thesis is European manufacturing industry, and it investigates the opinions of supply chain collaboration from three different sub-industries of the total manufacturing industry; Manufacture of fabricated metal products, except machinery and equipment, manufacture of machinery and equipment and manufacture of basic metals. According to Eurostat-website (2017), the EU-28 countries had amount of 491200 enterprises combined in these three industries in 2014.

	Number of enterprises (thousands)	Number of persons employed	Turnover	Value added (EUR million)	Personnel costs
Manufacturing	2 110.0	29 900.0	7 110 000.0	1 710 000.0	1 100 000.0
Manufacture of food products	265.7	4 077.0	945 000.0	181 000.0	108 000.0
Manufacture of beverages	26.2	400.0	150 329.5	37 778.6	16 700.0
Manufacture of tobacco products	0.3	41.3	44 366.3	7 355.0	2 148.8
Manufacture of textiles	61.3	609.6	77 000.0	22 000.0	15 000.0
Manufacture of wearing apparel	123.4	971.7	71 206.8	19 779.9	13 484.6
Manufacture of leather and related products	37.1	443.9	53 771.2	14 272.1	8 491.6
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	173.0	984.1	124 447.6	31 228.7	20 561.7
Manufacture of paper and paper products	20.2	641.0	180 671.7	43 443.8	26 000.0
Printing and reproduction of recorded media	125.1	736.5	82 434.2	30 000.0	21 000.0
Manufacture of coke and refined petroleum products	1.1	117.9	557 103.4	7 314.1	8 769.7
Manufacture of chemicals and chemical products	28.6	1 146.0	537 109.3	114 709.4	64 278.9
Manufacture of basic pharmaceutical products and pharmaceutical preparations	.	564.0	245 206.8	84 412.6	36 865.5
Manufacture of rubber and plastic products	62.5	1 657.1	300 000.0	.	.
Manufacture of other non-metallic mineral products	95.3	1 224.8	204 754.0	62 148.7	41 167.7
Manufacture of basic metals	17.2	1 000.0	340 000.0	62 000.0	44 000.0
Manufacture of fabricated metal products, except machinery and equipment	382.3	3 604.5	469 449.8	167 100.9	114 038.6
Manufacture of computer, electronic and optical products	41.7	1 093.7	290 637.5	78 096.5	53 610.5
Manufacture of electrical equipment	48.0	1 450.8	294 826.5	87 155.1	63 682.3
Manufacture of machinery and equipment n.e.c.	91.7	2 910.0	640 000.0	200 000.0	141 000.0
Manufacture of motor vehicles, trailers and semi-trailers	.	2 369.9	925 430.6	181 529.6	116 142.0
Manufacture of other transport equipment	14.2	740.0	194 000.0	54 000.0	40 000.0
Manufacture of furniture	119.7	955.5	95 485.3	29 464.3	21 438.0
Other manufacturing	155.1	887.9	117 029.1	43 466.0	26 511.6
Repair and installation of machinery and equipment	197.1	.	165 089.3	63 324.9	45 953.3

(.) not available
Source: Eurostat (online data code: sbs_na_ind_r2)

Figure 4. Number of enterprises in manufacturing industry inside EU28-countries (Eurostat 2017)

The results are gathered from 67 phone interviews, where respondents impressed their opinions on barriers of supply chain collaboration. According to the SurveyMonkey-

website, 67 was the suitable sample size of the survey, where 95% confidence limit and 12% margin of error are taken into account.

Calculate Your Sample Size:

Population Size: 491200

Confidence Level (%): 95

Margin of Error (%): 12

CALCULATE

Sample Size: 67

Figure 5. Sample size according to SurveyMonkey-website calculator

Foundations and barriers of SCC are being introduced in the literature review chapter. Because the literature review points out many important areas and barriers of SCC, this thesis concentrates to only four of them. This thesis investigates the opinions of respondents on these four barriers:

1. Lack of collaborative strategic planning
2. Inaccurate and inadequate information sharing
3. Customers' unwillingness to share risks and rewards
4. Inconsistent and inadequate performance metrics

The first barrier of this research aims to find out if supplier organizations are planning strategic issues collaboratively and receiving enough strategic information from their customers, which would help them to adjust their production and this way serve their customers more efficiently and effectively. The second selected barrier is a continuum for the first previously explained barrier. It investigates if supplier organizations receive quality and accurate information, which would enable them to serve their customers in best possible way. Third barrier tests the mutuality of relationship in terms of

customers' unwillingness to share risks and rewards. It examines if the customers of supplier organizations are, in this vital part of SCC, willing to share risks and rewards consistently between the two sides. Finally, since visibility of information is also at the centre of SCC, it is investigated in terms of performance metrics. The purpose for this is to gain understanding if suppliers understand the metrics that they are evaluated with, and if they are visible towards them. If these metrics are visible towards supplier organizations and in alignment, suppliers should have the criteria at their concieousness, with which help they could reach to the strategic level of partnership with their customers.

Because information sharing is a vital part of SCC, the collaboration systems of supplier organizations were inquired in the interviews. With the information of different collaboration systems that suppliers are using with their customers, this research aims to find out how can the information sharing network be characterized, and what is the current state of supply chain collaboration in these target industries. In addition, the respondents were asked to impress their opinions on each barrier with 1-5 likert scale. In some cases, respondents opened their insights about barriers with concrete examples, and allowed their insights to be published. Due to this, the research uses both quantitative and qualitative research methods in analysing the results. Thus, the triangular research method, which is a mixed method approach, was selected to this thesis (Greener & Martelli 2015: 44).

Organizations, who were willing to share their opinions on supply chain collaboration, are clients of company X, whose behalf this thesis is partly prepared. Company X is specialized in IT and it has created a cloud-based collaboration platform for manufacturing companies. The demographic information of the respondents has collected from Internet sources, e.g. LinkedIn or company websites. The revenue information of the companies has been collected from Orbis-database or in some cases from Finder or Asiakastiето-websites.

The analysis part of the thesis is quantitative, where histograms and tables are used to describe the frequencies and percentual shares of each opinion. Also, Kruskal-Wallis test is used to analyse the differences of opinions in each department. These tests were made with SAS Enterprise Guide-software. However, results of the thesis cannot be interpreted fully by these methods. Therefore, discussion part is the qualitative part of the thesis. It plays a fundamental role in this thesis, where reasons behind respondent's opinions are introduced with concrete examples from their experiences of supply chain collaboration in practice, and some solutions to improve the current state of supply chain collaboration are offered.

4. ANALYSIS OF THE SURVEY

Upcoming part of the thesis will be concentrating on analysis of the results gathered for this thesis. Results have been collected from interviewing 67 companies from manufacturing industries inside EU-28 countries. The goal of this thesis was to investigate supplier organizations point of view on the barriers of supply chain collaboration, which are presented during the literature review-part of the thesis. Firstly, descriptive statistics of the contacted companies is presented. Secondly, the results of the interview-questions are opened up. Thirdly, background information of the results is introduced. Later on during the thesis, the discussion-part will provide some insights from the respective interviewees on the current state of supply chain collaboration.

4.1. Descriptive statistics

For this survey total number of 67 companies were contacted. Companies are operating in manufacturing of fabricated metal products, except machinery and equipment, manufacture of machinery and equipment and manufacture of basic metals- industries. These supplier organizations can be categorized as contract manufacturers, subcontractors or suppliers of technology. (Figure 6.)

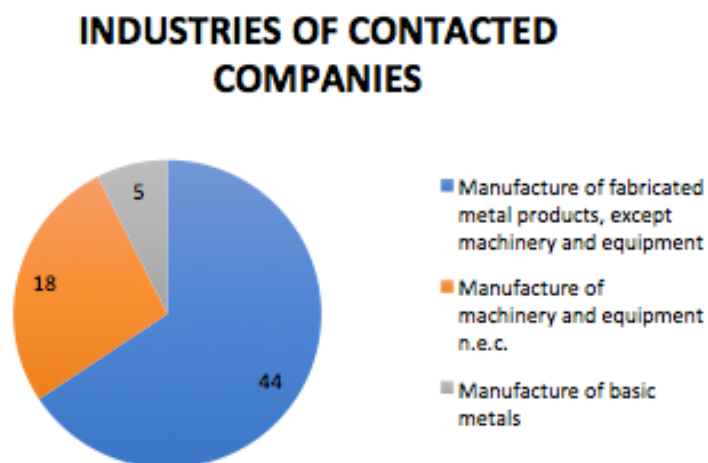


Figure 6. Industry allocation of contacted companies

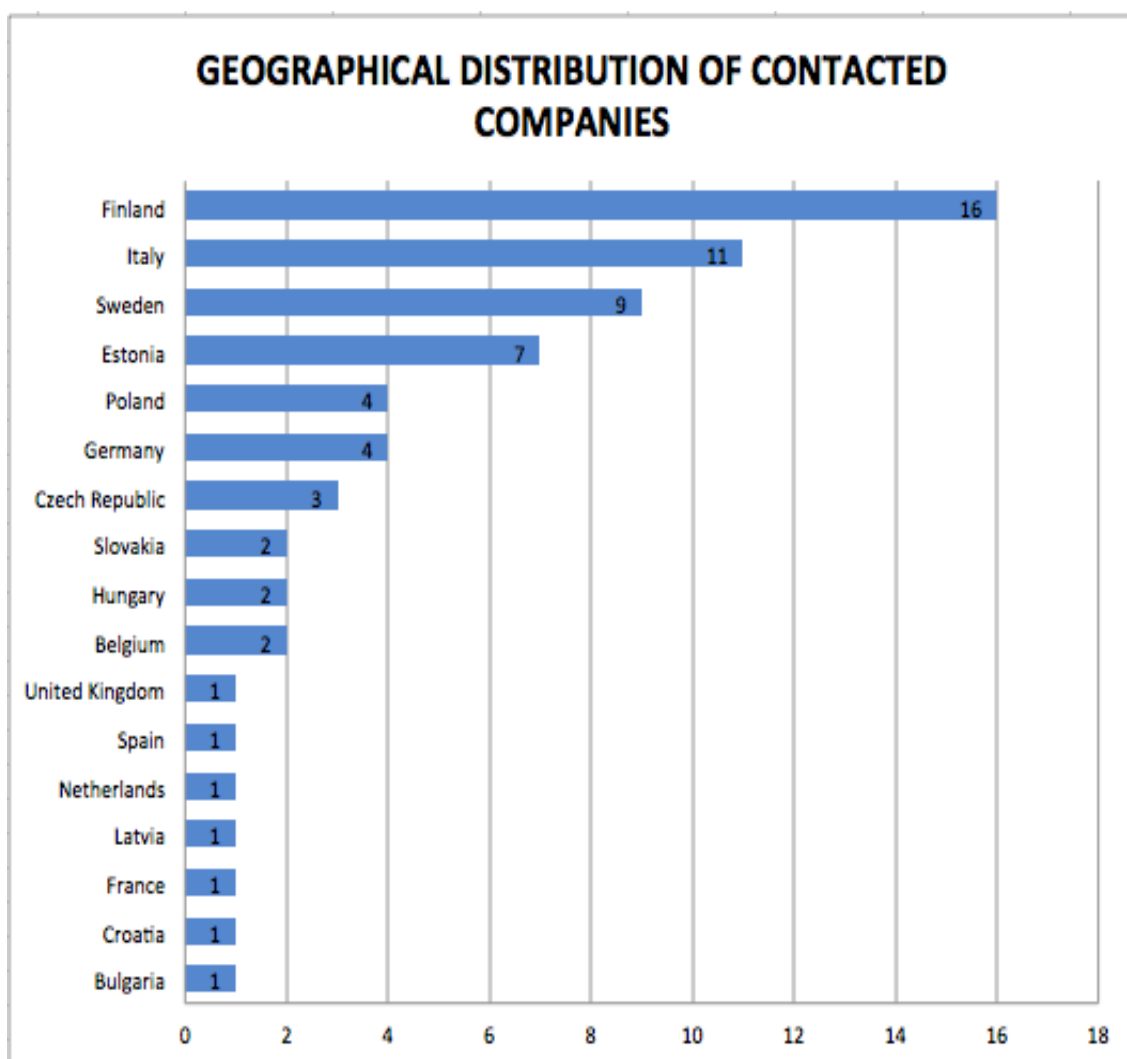


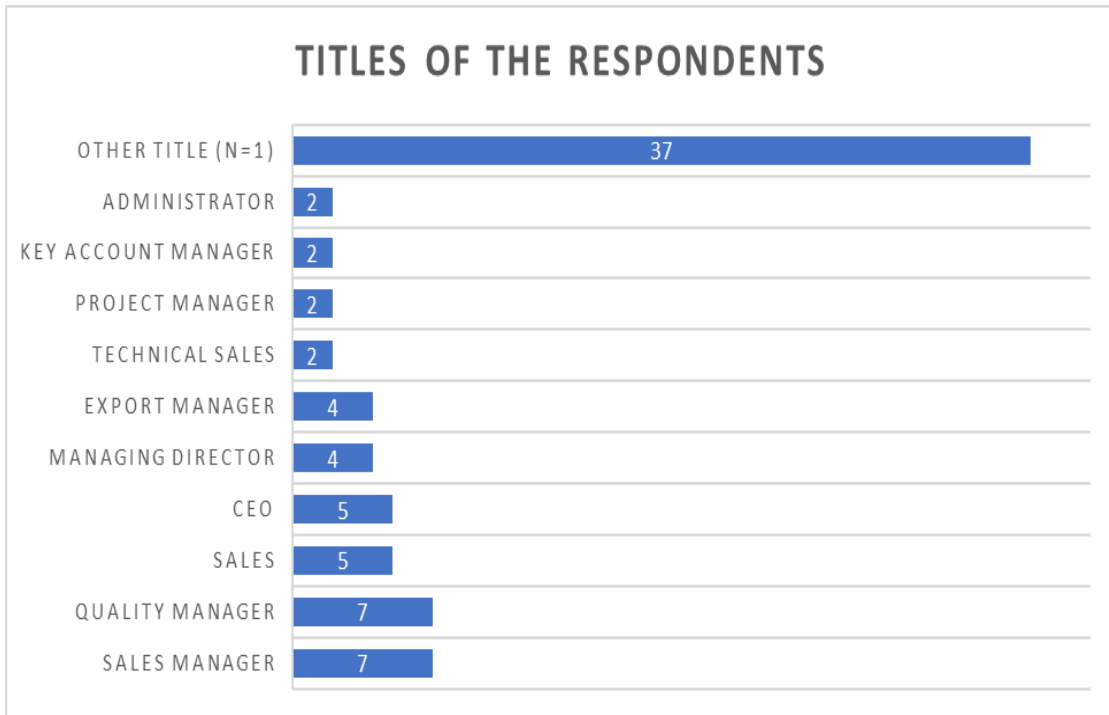
Figure 7. Geographical distribution of contacted companies

Figure 7. represents the geographical distribution of contacted companies. The target segment was EU-28-market, which consists of current EU-countries and the United Kingdom, which still belongs to the EU while this research was being produced. Finland was the most common country where contacted companies were operating, with 16 different interviews. Italy (with 11 respondents) and Sweden (9 respondents) followed after, while Estonia (7 respondents), Poland (4 respondents) and Germany (4 respondents) each had several respondents. In total, companies from 17 out of 28 countries were contacted inside the segment.

Table 1. One-way frequencies: respondents per department**ONE-WAY FREQUENCIES: RESPONDENTS PER DEPARTMENT**

Department	Frequency	Percent	Cumulative frequency	Cumulative percent
C-level	12	18 %	12	18 %
Production	9	13 %	21	31 %
Quality	9	13 %	30	45 %
Sales	37	55 %	67	100 %

Over half of the respected respondents were working in Sales-department, while C-level was the second most common department. 9 persons were also contacted from production and quality departments. Most common titles of the respondents were Sales Manager, Quality Manager, CEO, Sales, Managing Director or Export Manager. Each of the previously mentioned titles appeared several times during the interviews.

**Figure 8.** Titles of the respondents

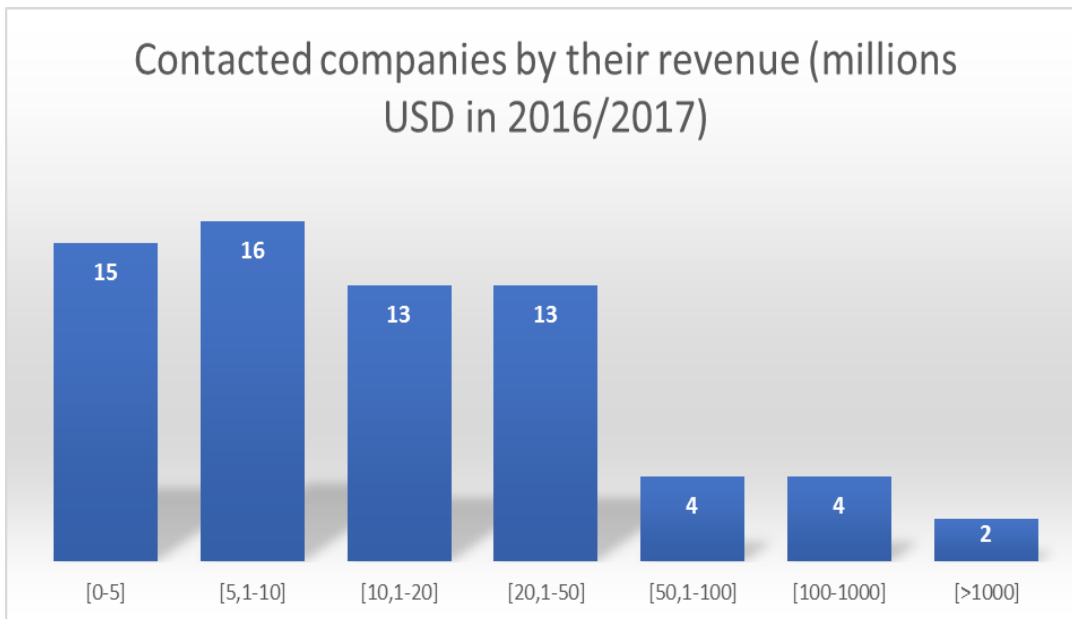


Figure 9. Revenue distribution of the contacted companies.

Most of the contacted companies, to be precise, 31 out of 67 had under 10 millions USD revenue in 2016/2017. While the survey also had big companies that were recording over 100 million to over 1 billion revenue during the same year(s), it can be stated that the companies that were contacted for this survey were mostly small- and medium sized enterprises (SME's).

4.2. Frequencies and percentages by questions

This survey investigated the opinions of the respondents on barriers of supply chain collaboration. This section covers the frequencies of each answered question and the percentual distribution of the answers. The reason for this is to show the general distributions of answers by each question, before the next chapter where the real analysis-part begins. In that chapter, the distributions of each department are being investigated more in detail.

4.2.1. Frequencies of Q1: "Do you feel that there is a lack of collaborative strategic planning with your clients?"

According to the answers represented in Figure 10, most common answer to this question was the neutral alternative number 3, which gathered over 35% of the answers. This statement was considered to be more as a barrier than not according to results by respondents due to number 4 and number 5 acquiring more answers than number 1 and 2. The results implicate that supplier organizations do not receive enough demand forecasts, inventory level reports or do not have joint business plans with their customers.

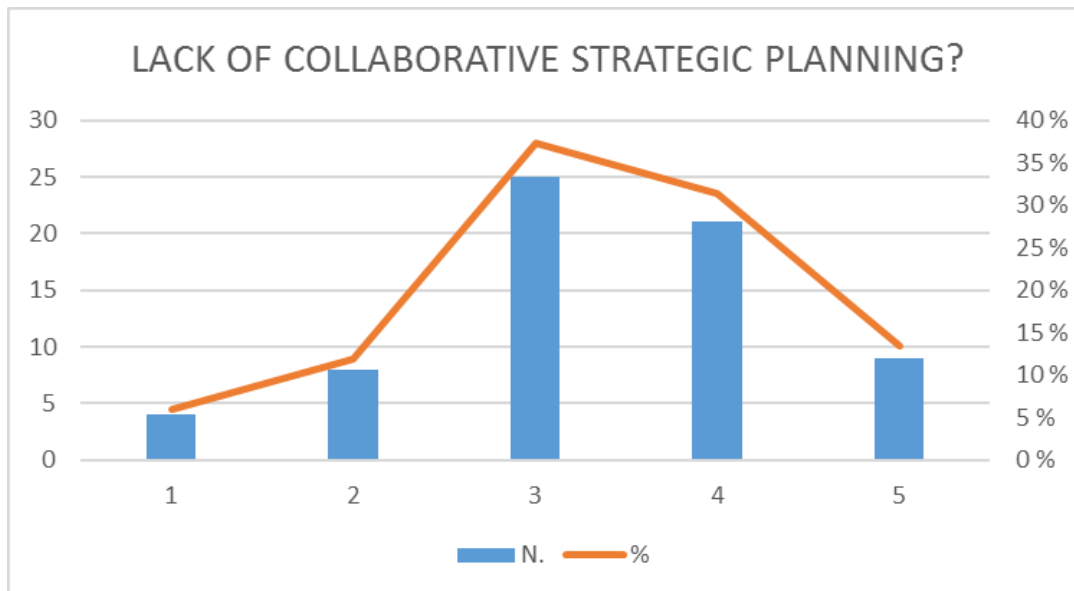


Figure 10. Frequencies of the Q1: "Do you feel that there is lack of collaborative strategic planning with your clients?"

4.2.2. Frequencies of Q2: "Do you think that the information is shared inaccurately by your clients?"

Second question did not perform very well in terms of minimum and maximum alternatives. Only three respondents highly agreed that the information is shared

inaccurately from their clients, while eight respondents did not agree at all that the information is shared inadequately. Again, number three and four were the most popular answers in this question. According to the answers, it can be concluded that the level of information sharing from customer organizations varies a lot. Some organizations are very clear when it comes to communicating or sharing information with suppliers, while in some cases that is not happening at all.

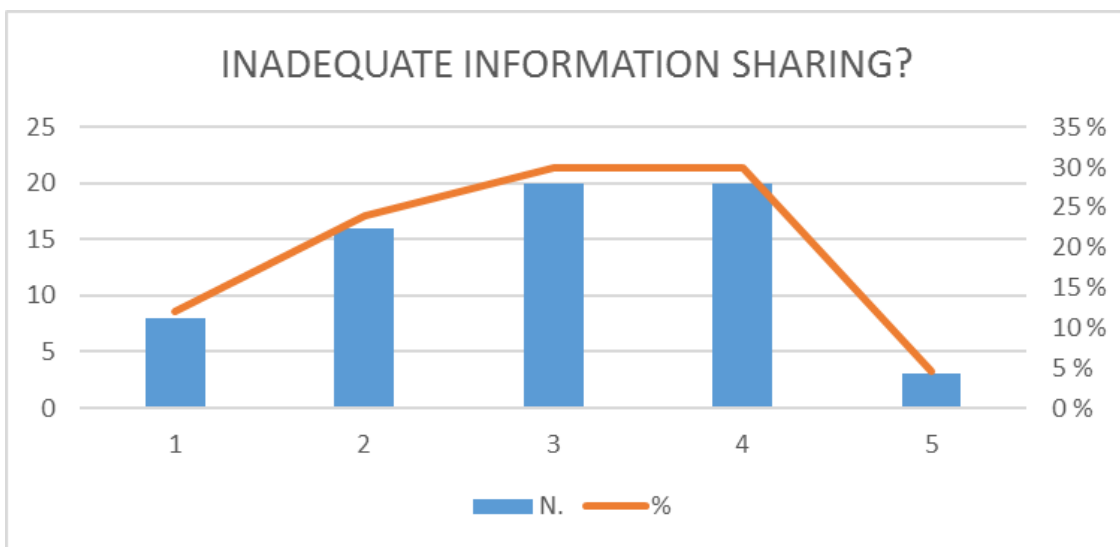


Figure 11. Frequencies on Q2: "Do you think that the information is shared inaccurately by your clients?"

4.2.3. Frequencies of Q3: "Do you feel that your clients unwilling to share risks and rewards with you?"

Third question investigated what supplier organizations feel on their clients' tendency to share risks and rewards in their respective partnerships. The most common answer of the respondents was "agree". Notable is also that "highly agree"-alternative had most answers in this question compared to other ones. According to the general opinion of the respondents, their customers seem to treat them unfairly in terms of sharing risks and rewards. The reason for this could be explained by supplier organizations attractiveness to customer. If there is only couple of orders that customer is placing to

their supplier in a year, then supplier organization cannot be considered as a strategic supplier to the customer organization. This could lead to negotiation of contracts, where the risks are placed more towards suppliers.

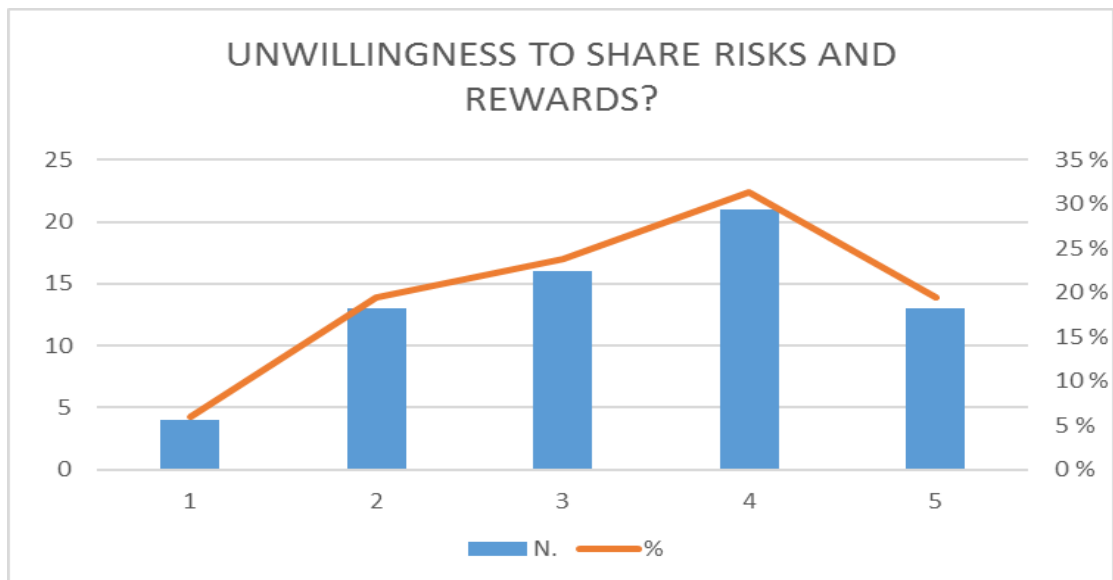


Figure 12. Frequencies on Q3: "Do you feel that your clients are unwilling to share risks and rewards with you?"

4.2.4. Frequencies of Q4: "Do you always understand what kind of metrics your customers are using while evaluating your performance?"

Fourth question had most answers in "disagree"-alternative, while "highly disagree" was the second most popular answer. According to these answers, performance metrics that are used by customer organizations are quite clear to supplier organizations. This suggests that customer organizations are reporting the performance of suppliers to supplier management team. In order to fully implement the performance metrics used by a customer to every persons mind inside supplier organization, the information must flow from top-down. In some cases, the customer organization has been quite unclear about the metrics that they are using, or then the management team inside supplier organization has failed in communicating the improvement actions down to the other

personnel, so the organization could improve their performance in terms of the performance measurement metrics that are being used by customer organization.

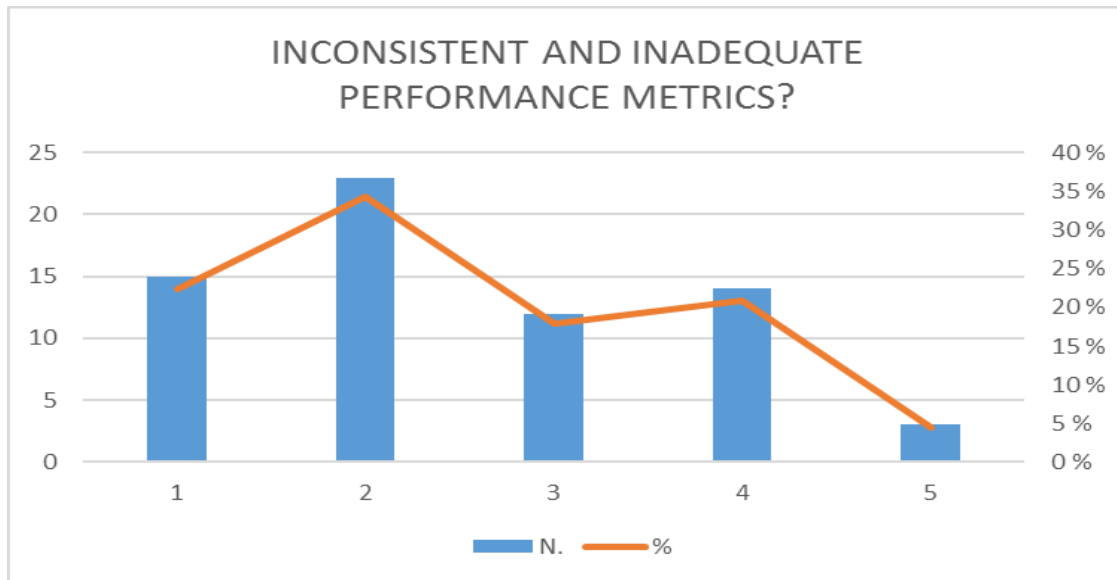


Figure 13. Frequencies on Q4: "Do you always understand what kind of metrics your customers are using while evaluating your performance?"

4.3. Analysis of answers by departments

Now the general frequencies and percentages of the answers have been revealed. Before the thesis will turn its attention to distributions of answers by department, a quick investigation shall be presented on the answers by each department on each question. In this chapter, the frequencies of answers given by personnel of different departments in each question are analysed.

According to the findings, the variability between answers of each department can be identified. There are some interesting findings, which are introduced from now on during the chapter. Some concrete examples behind these answers from supplier organizations personnel will be presented in the discussion part at the end of the thesis.

4.3.1. Answers of Q1 by each department: "Do you feel that there is lack of collaborative strategic planning with your clients?"

Table 2. Answers by department: "Do you feel that there is lack of collaborative strategic planning with your clients?"

ANSWERS BY DEPARTMENT : LACK OF COLLABORATIVE PLANNING?								
GRADE	C-level	%	Production	%	Quality	%	Sales	%
1	2	17 %	0	0 %	0	0 %	2	5 %
2	1	8 %	1	11 %	0	0 %	6	16 %
3	3	25 %	5	56 %	5	56 %	12	32 %
4	4	33 %	2	22 %	3	33 %	12	32 %
5	2	17 %	1	11 %	1	11 %	5	14 %

First question investigated if the contacted persons felt that there should be more collaborative strategic planning with their customers. Results indicate that C-level agree more than disagree with the question, and there should be more of these joint actions made with their customers. This is quite understandable, since executives of supplier organization should be expected to pursue for a strategic partnerships with their customers. This goal can be achieved by planning collaboratively about the future projects and actions. Production department personnel seemed to have a quite neutral point of view of this barrier. Thus, there was only one person who disagreed with the question. Personnel of the quality department considered this as a barrier due to the fact that there were zero respondents who completely disagreed with the statement. If there were a desired level for strategic collaborative planning with the customers, quality personnel would have the information that they need for assuring the quality of their products is in the level that is agreed collaboratively. Quality personnel could also benefit from the transferred expertise that they could receive from the experts of their customer organizations. According to the results, sales personnel also felt that there indeed is a lack of collaborative strategic planning with their clients. With the right amount of collaborative strategic planning, sales people could improve serving their clients, for example by having access to their demand forecasts, so mutual business plans could be created for ensuring right amount goods in terms of replenishment orders are being shipped from suppliers' side to the customer.

4.3.2. Answers of Q2 by each department: "Do you think that the information is shared inaccurately by your clients?"

Table 3. Answers by department: "Do you think that the information is shared inaccurately by your clients?"

ANSWERS BY DEPARTMENT: INADEQUATE INFORMATION SHARING?								
GRADE	C-level	%	Production	%	Quality	%	Sales	%
1	1	8 %	1	11 %	1	11 %	5	14 %
2	2	17 %	4	44 %	2	22 %	8	22 %
3	2	17 %	2	22 %	4	44 %	12	32 %
4	6	50 %	1	11 %	2	22 %	11	30 %
5	1	8 %	1	11 %	0	0 %	1	3 %

According to the results, C-level respondents agreed strongly that the information that they receive from their customers is shared inaccurately and can be considered as inadequate. However, there were again some individuals who disagreed or highly disagreed with this statement within C-level respondents. Because still the majority of the executive level respondents consider this as a barrier, it can be underlined that c-level personnel would appreciate if customer organizations would have standardized methods for information sharing, which would ensure that suppliers are more responsive for serving their customers with the quality information that they receive from their customers. Since production department personnel did not share the same opinion regarding this barrier and while most of the quality personnel who responded to the questions had a neutral point of view on this barrier, no major conclusions can be made. Sales personnel on the other hand had divergent views on whether this statement is a major barrier or not. 12 individuals and only one respondent highly agreed with this statement, while 13 felt that inadequate information sharing is not a problem in their customer relationships. These findings reflect to the fact that supplier organizations seem to understand the information shared by their customers quite well.

4.3.3. Answers of Q3 by each department: "Do you feel that your clients are unwilling to share risks and rewards with you?"

Table 4. Answers by department: "Do you feel that your clients are unwilling to share risk and rewards with you?"

ANSWERS BY DEPARTMENT: UNWILLINGNESS TO SHARE RISKS AND REWARDS

GRADE	C-level	%	Production	%	Quality	%	Sales	%
1	1	8 %	0	0 %	1	11 %	2	5 %
2	0	0 %	1	11 %	2	22 %	10	27 %
3	1	8 %	2	22 %	4	44 %	9	24 %
4	5	42 %	4	44 %	1	11 %	11	30 %
5	5	42 %	2	22 %	1	11 %	5	14 %

Third research question aimed to investigate if supplier organizations felt that the customer organizations are not willing to share risks and rewards with them. According to the answers, C-level strongly agreed with the statement. There was only one individual among the department that did not agree at all with the statement. The executives of supplier organizations of course want to have their share of the rewards created by the mutual contract as well. According to the results, the respondents in this department feel that risks are placed more towards their side, and the rewards flow straight into their customers. Because of this, supplier organizations do not receive the desired amount of revenue from their contracts, and they are facing longer payment cycles for getting their share of contracts in terms payments. Production department shared the concern on this statement with the C-level executives. Almost 65% of the respondents agreed or highly agreed with the statement. Production personnel clearly feel that risks are also placed more towards their organization, which creates them pressure to produce greater amounts of goods and components, and strictly adjust to the tight schedules that they are facing, with the prize of low rewards for their pursuit. Quality personnel had the highest population on neutral point of view, and slightly more respondents felt that this statement cannot be considered as major barrier. Sales department individuals had more population on the "agree"-side than on "disagree"-side, so there was some variability with their answers on this statement as well.

4.3.4. Answers of Q4 by each department: "Do you always understand what kind of metrics your customers are using while evaluating your performance?"

Table 5. Answers by department: "Do you always understand what kind of metrics your customers are using while evaluating your performance?"

ANSWERS BY DEPARTMENT: INCONSISTENT AND INADEQUATE PERFORMANCE METRICS?

GRADE	C-level	%	Production	%	Quality	%	Sales	%
1	2	17 %	1	11 %	1	11 %	11	30 %
2	4	33 %	5	56 %	3	33 %	11	30 %
3	2	17 %	1	11 %	3	33 %	6	16 %
4	4	33 %	2	22 %	2	22 %	6	16 %
5	0	0 %	0	0 %	0	0 %	3	8 %

Final question investigated if suppliers are familiar with the performance metrics that are used in evaluation of their performance by their customers. Some individuals in C-level-personnel felt that this is a problem in their customer relationships, but there were more individuals having "highly disagree" or "disagree"-opinion on this question. Production-department seems to understand the performance metrics that their customers evaluate them, when almost 70% disagreed or highly disagreed with the statement. Quality personnel had majority in the "disagree"-side as well, but the neutral point of view was a popular alternative as well. Among the sales department personnel, there was 60% of the population that did not consider the performance metrics to be inconsistent and inadequate. According to the results, each one of the departments seem to understand the performance metrics that are used in their performance evaluation, even though there is variability among the groups.

5. ANSWER DISTRIBUTIONS BY DEPARTMENT

This chapter of the thesis investigates the distributions of answers by departments. Analysis is done with SAS Enterprise Guide 7.1. – software, and the upcoming statistic tables are produced from it. The goal of these analyses is to find a conclusion if supplier organizations agree among departments that there is some certain barrier that is considered to be a major obstacle for successful supply chain collaboration with their client organizations. Kruskal-Wallis test was chosen as an appropriate method to analyse the results. In these tests, "Department" represents an independent variable, and the research questions stands as a dependent variable.

In the tables below, following abbreviations are used for the departments:

A= C-level

B= Production

C= Quality

D= Sales

5.1. Distributions of answers by Q1: "Do you feel that there is a lack of collaborative strategic planning with your clients?"

First research question investigated if different departments inside supplier organizations feel that there is a lack of collaborative strategic planning with their customers. In this test variable "collaborative planning" is used as an abbreviation for research question number one.

Following hypotheses are used to interpret the results:

H0: The distributions of the populations are the same.

H1: The distributions of the populations are not the same.

Table 6. Kruskal-Wallis test results: Distributions of Q1

Nonparametric One-Way ANOVA					
The NPAR1WAY Procedure					
Wilcoxon Scores (Rank Sums) for Variable Collaborative planning? Classified by Variable Department					
Department	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
A	12	406.50	408.0	58.438640	33.875000
B	9	292.50	306.0	51.971276	32.500000
C	9	332.00	306.0	51.971276	36.888889
D	37	1247.00	1258.0	75.786111	33.702703
Average scores were used for ties.					
Kruskal-Wallis Test					
Chi-Square		0.2850			
DF		3			
Pr > Chi-Square		0.9628			

Following results (Table 6.) illustrate that departments have quite different point of views on this barrier. In the previous chapter the frequencies and percentual distribution of each department has been introduced. (Table 2.) These results show that there is a lot of distribution inside departments, so it is not possible to point out certain dependencies among groups.

Because the Kruskal-Wallis test shows that $Pr > Chi\text{-}Square$ is 0.9628, we can reject the null hypotheses and accept the H1, so the distributions of the populations are not the same.

5.2. Distributions of answers by Q2: "Do you think that the information is shared inaccurately by your clients?"

Second research question aimed to find if supplier organizations see information sharing as inaccurate and inadequate from customer organization side. In this test, variable "information sharing" is used as an abbreviation for research question number two.

Following hypotheses are used for testing the results:

H0: The distributions of the populations are the same.

H1: The distributions of the populations are not the same.

Table 7. Kruskal-Wallis test results: Distributions of Q2

Nonparametric One-Way ANOVA					
The NPAR1WAY Procedure					
Wilcoxon Scores (Rank Sums) for Variable Information sharing? Classified by Variable Department					
Department	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
A	12	499.50	408.0	59.026935	41.625000
B	9	260.00	306.0	52.494466	28.888889
C	9	284.50	306.0	52.494466	31.611111
D	37	1234.00	1258.0	76.549042	33.351351
Average scores were used for ties.					
Kruskal-Wallis Test					
Chi-Square		2.8265			
DF		3			
Pr > Chi-Square		0.4192			

According to the results (Table 7.), there is variability between and inside the groups. (Table 3.) Because $Pr > \text{Chi square}$ is 0.4192, H0 is rejected and H1 is accepted.

5.3. Distributions of answers by Q3: "Do you feel that your clients are unwilling to share risks and rewards with you?"

Previous research suggests that successful supply chain collaboration requires that risks and rewards are divided equally between the supply chain partners. Thus, according to the results (Table 4.) that statement does not seem to occur in practice. However, this test aims to find a conclusion if the departments share the same opinion e.g. the distributions of the answers between departments are the same. In this test, variable "sharing risks and rewards" acts as an abbreviation for Q3.

Following hypotheses are used for testing the results:

H0: The distributions of the populations are the same.

H1: The distributions of the populations are not the same.

Table 8. Kruskal-Wallis test results: Distributions of Q3

Nonparametric One-Way ANOVA					
The NPAR1WAY Procedure					
Wilcoxon Scores (Rank Sums) for Variable Sharing risks and rewards? Classified by Variable Department					
Department	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
A	12	553.00	408.0	59.323298	46.083333
B	9	360.00	306.0	52.758030	40.000000
C	9	231.50	306.0	52.758030	25.722222
D	37	1133.50	1258.0	76.933380	30.635135
Average scores were used for ties.					
Kruskal-Wallis Test					
Chi-Square		8.7100			
DF		3			
Pr > Chi-Square		0.0334			

According to the results (Table 8.), $Pr > \text{Chi-Square}$ is 0.0334. Therefore, H0 can be accepted with a 95% confidence interval and can be considered as statistically significant. So in this case, the distribution of answers between different departments is the same.

5.4. Distributions of answers by Q4: "Do you always understand what kind of metrics your customers are using while evaluating your performance?"

Fourth research question investigated if supplier organizations understand the performance metrics that are used by their respective customer organizations in evaluation of their performance. In other words, the aim was to find if customer organizations in manufacturing industry keep their performance metrics visible towards

their suppliers. Again, the test uses abbreviation "performance metrics" as a synonym for Q4.

Following hypotheses are used for testing the results:

H0: The distributions of the populations are the same.

H1: The distributions of the populations are not the same.

Table 9. Kruskal-Wallis test results: Distributions of Q4

Nonparametric One-Way ANOVA					
The NPAR1WAY Procedure					
Wilcoxon Scores (Rank Sums) for Variable Performance metrics? Classified by Variable Department					
Department	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
A	12	443.00	408.0	59.089484	36.916667
B	9	302.50	306.0	52.550092	33.611111
C	9	337.50	306.0	52.550092	37.500000
D	37	1195.00	1258.0	76.630158	32.297297
Average scores were used for ties.					
Kruskal-Wallis Test					
Chi-Square	0.9055				
DF	3				
Pr > Chi-Square	0.8241				

The results of this test suggest that answer distributions between departments seem to vary a lot. Because $Pr > \text{Chi-Square}$ is 0.8241 H0 cannot be accepted. Therefore, H0 is rejected and H1 is accepted with respect to the results of Kruskal-Wallis test (Table 9.).

5.5. Summary of the analysis

The results suggest that distributions are not quite the same between departments when it comes to assessing the barriers of SCC. Only the distributions of Q3, customers' unwillingness to share risks and rewards, are the same between the departments.

Otherwise the distributions are not the same between departments about the barriers of supply chain collaboration. In this test, the relatively small amount of respondents reflects to the standard deviations of the tests, so that explains the surprisingly high P-values in the tests. Also because this tests uses Likert 5-point scale, it might sometimes be too tempting to select number three, “the neutral”- alternative, as an answer. This fact indeed has an influence towards the distributions of the answers between different departments.

6. DISCUSSION AND DEVELOPMENT SUGGESTIONS

This chapter provides background information about the answers that were analysed in previous chapters. Many respondents opened their thoughts about their answers so concrete examples from manufacturing industry are brought up to the readers attention. At the beginning of this chapter, the current state of supply chain collaboration of the manufacturing industries inside EU-28 countries will be described. After that, more exclusive information about the respondents' experiences are revealed. Ultimately, some development ideas for more effective supply chain collaboration shall be presented.

6.1. The current state of supply chain collaboration

In manufacturing industry inside EU-28 countries, there are a lot of collaborative activities among supply chains. The nature of the industry is very complex, and due to globalisation many customer organizations have outsourced some fundamental activities to suppliers, so they could focus on their core-competencies. Also, because greater amount of top quality suppliers became more available, customer organizations have the capability to source different materials and components from new geographical areas. Because of this, supply chains need to be controlled and monitored more carefully. Many big corporations have reacted to this fact, and they have designed their own portals, where they can monitor and evaluate the performance of their suppliers.

The trend of setting up own portals has created an unfavourable situation for the suppliers. Many respondents pointed out that they have at least 10 to 15 different portals with their customers. Many of these portals are not user-friendly at all, and suppliers have been forced by customers to start using these portals for quality issues or reaching out to the order-information that their customers are preparing for them. Most of the supplier organization personnel stated that the usage of all of these different portals is not beneficial for their side at all.

Along with the portals, there are numerous of different ways for customers to control their supplier base. Respective respondents claimed that they are familiar with EDI-connections, extranets and web-folders in their customer relationships. It does not come surprising that all of the supplier organizations are using e-mail as their main communication-channel. Thus, a lot of orders, forecast-reports, claims and engineering change requests are moving among e-mails. In supplier-customer relationships, many of the respondents felt that they must obey the will of customers, so whatever the method for sharing information in supply chain collaboration is, suppliers have no other choice than to agree with the customer and proceed with the method that is asked, or even forced, by the customer organization.

It can be stated that the information-sharing network of SCs is very complex due to different methods and systems that are used for sharing information and collaborating among SC partners. This creates an environment, where there is a lot of friction inside the supply chains, and the information is not completely visible towards each member of the supply chain.

6.2. Barriers of supply chain collaboration from suppliers' point of view

According to the respondents, many of the group felt that there is room for development in supply chain collaboration. Respondents shared their insights and gave some practical examples from their customer-relationships about issues that could be improved, so the relationship itself would turn valuable for both parties. Following subchapters describe the common issues in these supplier-customer relationships and at the end of this chapter, some managerial implications and suggestions for the future methods of supply chain collaboration are presented.

6.2.1 Lack of collaborative strategic planning

During the interviews, one respondent claimed that in the Finnish manufacturing industry, collaborative planning does not basically exist. Usually customers need to start the process for collaborative planning-activities due to their stronger position in the relationships generally. According to the same respondent, many big corporations are not willing to share their demand forecasts with their suppliers. CPFR-process, according to the CPFR-classifications (Ramanathan et al. 2014), seems to be in a basic level, where transactional data is being shared between the partners. In the survey, even though the distributions between the departments were not the same, the personnel of different departments shared the same opinion that there is a lack of collaborative strategic planning with their customers, and these examples reflect to results.

6.2.2 Inadequate and inaccurate information sharing

Respondents pointed out their concerns about inadequate and inaccurate information sharing with their customers during the interviews. In manufacturing industry, especially in the metal manufacturing ones, customer organizations need to use subcontractors in their process of creating their end products. In these project-related relationships, sometimes product, component or material-related specifications or instructions are missing. In addition, some respondents underlined that when there are mistakes and deviations in drawings, it will be time consuming to make corrections in them. In this case, it can be stated that the information that is shared from customers to suppliers, is not equipped with the desired quality, which allows suppliers to perform their requested tasks as conveniently as they could with desired level of quality information.

Some respondents also emphasized the amount of information they are receiving. In some cases, when the needed instructions could have been sent with couple of documents, they find themselves receiving hundreds of documents that are not relevant

for their purposes. Again, in some cases there is not enough necessary information that the supplier would need, so it takes extra amount of time to handle the situation.

The fact that was stated before regarding usage of different methods for sharing information will not help in tackling this barrier. With more suitable and convenient information sharing systems, it would be possible to generate more rewarding SCC also from the suppliers' perspective.

6.2.3. Customers' unwillingness to share risks and rewards

A lots of supplier organization personnel agreed that their customers are unwilling to share risks and rewards with them. Apparently, this phenomenon is common with big corporations. Many respondents defined this as a barrier with the big size companies. In these relationships, big companies can use their negotiation power with bad manners. This happens through the usage of extensive payment terms, which have increased a lot during one respondent's career in the industry. According to him, in the past payment terms used to be 30 days net, but nowadays they lie somewhere around 120 days. In these issues, if something goes wrong with the project, production or the delivery of the output, supplier is completely responsible. One respondent described this by using a metaphor where the project is worth amount of a bolt, but the customer demands the cost of a tractor, in the case where something goes wrong with the project or the supplier does not perform how it was expected.

Another respondent explained how the risks are allocated more towards supplier at the first stage of the supply chain, when he evaluated their partnership with one well-known company from manufacturing industry. When the relationship develops into a deeper level, the risks are shared in a more balanced way. Compared to the general feedback about this barrier, in this case collaboration between these partners seems to be quite healthy.

There is a lot of tendency to push the total risk towards suppliers, and to not share the rewards with them. Respondents also pointed out the customer's propensity to focus on low costs instead of overall quality. This is an unfavorable situation regarding valuable SCC-activities, where risks and rewards should be shared mutually and the mutuality of benefit should always be present.

6.2.4. Inconsistent and inadequate performance metrics

According to the respondents, performance metrics that customer organizations are using in evaluation of the performance of the supplier are quite clear to them. In couple of problematic relationships, the metrics were not in alignment between the both sides. For example, OTD (on time delivery) was defined as a metric, which had variability between the organizations. In these situations, customer organization had arranged a shipment for the product from transportation company. When the transportation company shipped the product late to the customer, which supplier had nothing to do with, it still reflected on the OTD of the supplier.

6.3. Managerial implications for more effective supply chain collaboration

There are numerous of different approaches, which could help suppliers to develop more sustainable SCC's with their customers. As it was stated in the literature review, information plays a huge part in the success of SCC. This section offers managers some insights, where information (and the quality of it) could help the suppliers to match the needs of their customers more effectively. Of course, customer-side needs to be open for new alternatives as well, and evaluate each suggestion presented by supplier with common sense. Because mutuality of responsibility, benefits, risks and rewards is underlined in SCCs, these implications should be reviewed collaboratively by supplier- and customer organizations.

Firstly, collaborative planning-activities should be enhanced and encouraged from suppliers to customers. Collaborative planning of activities helps suppliers to align their production towards the levels of customer demand. During these collaborative planning activities, the suppliers should also underline the importance of alignment of performance metrics, which should not differ between the two sides. Also, when customers are planning issues collaboratively with suppliers, it enhances the commitment of the suppliers. In terms of CPFR - activities, the developing- and advanced levels of CPFR should be pursued by both sides of the partnership (Ramanathan et al. 2014). By reaching the developing level and by sharing the demand forecasts, order planning and the promotional data, suppliers could re-adjust their production and inventory levels to serve their customers more efficiently. Ultimately if the two sides succeed to reach the advanced level of CPFR, information is shared transparently in their collaboration. Collaborative strategic planning in a partnership helps the two sides to capture the desired information visibility, which creates an environment where decisionmaking is more convenient due to the available strategic information and the ultimate goal, which aims the parties to create collaborative advantage, can be reached.

Information sharing is undeniably important for the success of SCCs. Suppliers need to underline the importance of sharing quality information, which helps them to meet the customer expectations and add increasing value to their partnership. When forming these partnerships, organizations should set up and agree the most suitable method for sharing information. Generally these methods that are included in SCC partnerships have the capacity to share information in just one or two activities and in addition, communication is done mainly by e-mails. Therefore, information sharing can be considered quite inflexible. The parties should look for alternatives, which allow them to perform multiple information sharing activities in a way that maximum visibility would be reached between the two sides. By setting up clear information sharing standards, suppliers would receive quality information and deviations and mistakes could be prevented.

Customer organizations unwillingness to share risks and rewards could be reduced by having more suitable information sharing methods, which helps suppliers increase their performance. If the supplier's ability to perform is continuous, then customers can offer them contracts with more advantageous terms and share the risks with them. Having more advanced information sharing systems allows suppliers to reach the strategic level of partnership, which creates more business between the partners.

Achieving information visibility in SCC grants partners to share the performance metrics simultaneously. If each metric would be visible among the partners, then there would be no deviations between the metrics of the two sides. This could be achieved by using suitable and integrated information systems.

With suitable IT-systems companies can enhance their SCC partnerships. Barriers like the lack of collaborative strategic planning, inadequate and inaccurate information sharing, customers' unwillingness to share risks and rewards and inadequate and inconsistent performance metrics can be tackled with the help of these systems. Findings from Shamsuzzoha, Toscano, Carneiro & Helo (2016) also defend this statement.

This thesis has now demonstrated the key findings from the literature regarding SCC. The empirical part of the research evaluated the opinions of supplier organizations on barriers of SCC and the current state of supply chain collaboration in terms of collaboration systems that supplier organizations are using with their clients. According to the results, there is not enough strategic collaborative planning between the supplier and the buying company. Also, the risks and rewards are not shared equally between the partners. The respondents of the contacted organizations, who are working in four different departments, had the same distributions between the departments in their answers regarding the latter barrier, but not regarding the preliminary one. Based on the results of this research, it is suggested that supplier organizations should be more active on being the initiative ones of the SCC relationship to set up strategic collaborative planning activities with their buyers. After collaborative strategic planning- activities

are set up and suppliers have shown their ability to perform continuously and lucratively, customer organizations can start involving their suppliers into new product development- actions, where the value for the end-customer of the SC will be created mutually.

Since the current state of supply chain collaboration is not beneficial for suppliers by the collaboration systems that they are currently using, supplier organizations should look for more effective solutions. If the information sharing systems are the most capable ones in these relationships, strategic collaborative planning activities can be performed easily. When the selected collaboration system has a versatile scope, it is easier for suppliers to climb up the ladders towards the level of strategic partnership. In this journey towards the level of strategic partnerships, buying customers become more and more open to share the risks and rewards with the supplier. With the help of these modern systems, also the performance metrics can be established and modified if needed to match the wanted outcome for both of the sides. At the end, the whole supply chain becomes agile, and continues to perform better than other competitive SCs even during the phases of rough competition. Modern SCC- platforms allow companies to use them simultaneously with all of their partners. It is suggested, that supplier organizations should look in to investing into these many-to-many kinds of platforms, which they could use with all of their customers, instead of traditional point-to-point portals. In this case, there would be one unique method for sharing information and performing SCC-related activities, and the information sharing network with their customers would be far more complex than the current one.

Before this research jumps in to conclusions, a fascinating topic is explained, which would enhance the performance of SCCs in manufacturing industry especially through its applications.

6.4. Digital supply chain

In 2010s, a lot of new phenomena have appeared. Companies need to address these themes very carefully, because they have a lot of potential for creating new kind of competitive advantage. In the late 2000s digitalisation emerged as a megatrend, which was brought up into a conversation everytime new phenomena were discussed that will change the business environment of the total world. After this, definition of Industry 4.0 appeared, which emerged by forming of various megatrends that have been born because of digitalisation. Nowadays in manufacturing industry, digital supply chain has emerged as a practice, which could offer more advanced potential for companies. Digital supply chain is a theme, which has developed from the background of these previously mentioned megatrends.

Figure 14 represents the digital supply chain, which is a center of digital enterprise-framework. Digital applications are enhancing the supply chains in visibility and productivity through the usage of disruptive technologies. The enablers of this transformation are technology, processes and organizations. According to the findings of the report published by World Economic Forum in 2017, companies in manufacturing sector believe that digital transformation results positive effects on additional revenue (22,6 %) and cost reduction (17,6%). (WEF 2017.)

Figure 1: The supply chain at the centre of the digital enterprise⁶

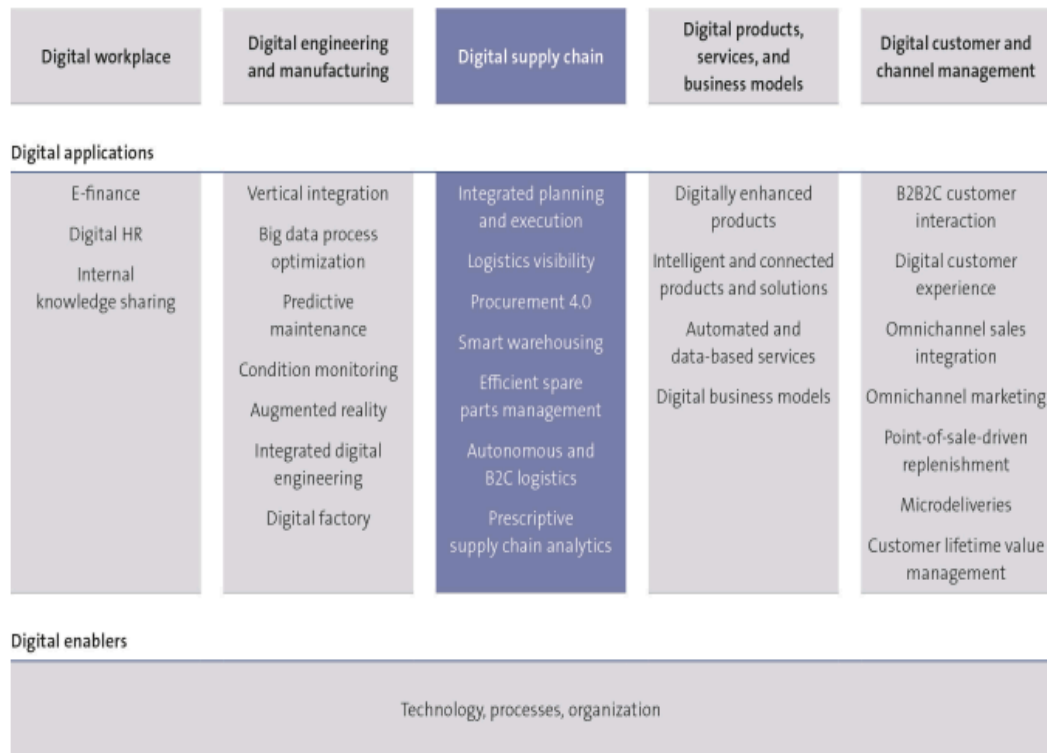


Figure 14. The digital supply chain (WEF 2017).

Digitalized supply chain leads to improved customer experience, revenue growth and increases the efficiencies. In order to achieve these benefits, companies will need to form an agile digital supply chain, and with the help of this, react to changes in both supply and demand. These kinds of supply chains are synchronously connected, informed, smart and automated. When products, customer experiences and business operations push companies to adopt digital-first mindset, these digital supply chains will reach to a notable competitive advantage over less agile competitors. According to the findings of Forbes Insight report (2018) manufacturing industry can be seen as an ambassador for SC digitalization due to their willingness to invest in digital technology, which allows them to gain higher amount of revenue and increased margins from the digitalization of supply chain. (Forbes 2018.)

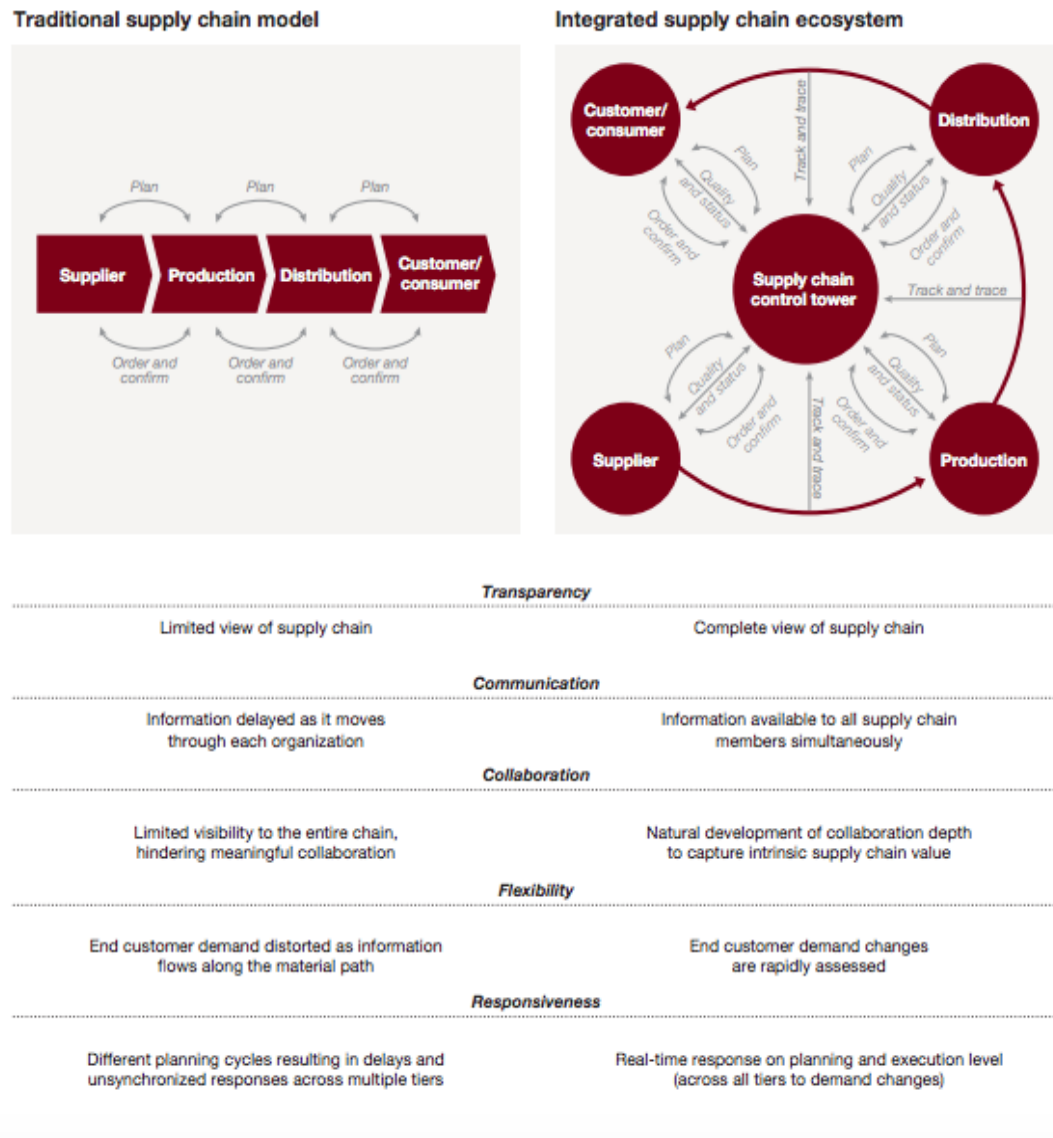


Figure 15. Traditional supply chain model vs integrated supply chain ecosystem. (PwC 2016)

Report published by PwC (2016) explains that the new SC ecosystem is based on the fully implemented digital technologies, among the likes of the cloud, big data, the Internet of things (IOT), 3D printing and augmented reality. These technologies are together forming new business models and are creating digitalization of products and services. This follows by digitalization and integration of single stage in a company's value chain. And at the heart of all this activity lies the digital supply chain, which leads

the transmission from traditional supply chains to integrated supply chain ecosystems. These kinds of ecosystems are equipped with great amount of transparency, immediately available information for every participant, possibilities for fruitful collaboration activities, opportunities to react rapidly to end-customer demand changes and real time response capacities. (Figure 15.)

How will this phenomenon increase the SCC? By pushing it to the new levels. SCC becomes easier to perform, when company boundaries are appearing less important to the effort to enhance efficiency and resilience of supply chains. This results to usage of cloud computing technologies and user-friendly platforms, which restructurizes the technological foundations. In this environment, collaboration is seen as practice, which will help companies to master the complexity of their supply chains and encourages companies to collaborate horizontally across industries, along with suppliers and customers inside their own industry. Horizontal collaboration is driven by the high opportunity in cost-savings through mutual activities, like collaborative procurement services and joint usage of transportation and inventory capacities. In addition, information sharing is recognized as driver of horizontal collaboration due to its ability to mitigate risks. According to a survey made in 2016 by WEF, SCC is seen as the sixth most influential driver in digital transformation of the value chains. (WEF 2017.)

7. CONCLUSION

This thesis offers some insights on supply chain collaboration from supplier organizations inside EU-28 countries. Respective respondents are operating in complex manufacturing industry, where lots of SCC activities are being performed. Because most of the SCC-research is made from customers' point of view, this thesis decided to focus on suppliers' side. The objective was to evaluate two research questions: *what is the current state of supply chain collaboration from suppliers' point of view* and *what is the suppliers' point of view on barriers of supply chain collaboration*.

The first research question was investigated with an open-ended question, where respondents' usage of different collaboration systems was asked. According to the answers, supplier organizations are using several different methods in information sharing with their customers, and the main mode of communication is e-mail. The general opinion of these information sharing methods was not positive, since most of the respondents felt that especially usage of several portals with their customers is not beneficial for their organization.

The second research question was investigated with questions regarding four barriers of supply chain collaboration. These four barriers were identified from the literature, and this thesis handpicked *lack of collaborative strategic planning*, *inadequate and inaccurate information sharing*, *customers' unwillingness to share risks and rewards* and *inadequate and inconsistent performance metrics* as main barriers of supply chain collaboration. The opinions of interviewees on these barriers were evaluated with a Likert 5-point scale from "highly disagree" to "highly agree". In the analysis part of the thesis, these answers were opened up and sorted by departments where respondents were working. According to the answers, *lack of collaborative strategic planning* and *customers' unwillingness to share risks and rewards* proved out to be most popular barriers among the group.

The analysis part tested the distributions of these barriers between the departments with Kruskal-Wallis test. The results suggest that there is agreeableness in opinions on *customers' unwillingness to share risks*, where the distributions of answers between departments were the same. In the other three, the distributions of answers between departments were not the same.

In the future, it is recommended that SCCs should focus on mutually agreeing the most suitable information sharing systems, which could help them to perform vital SCC activities. Since information sharing is at the core of SCC, SCC partnerships should focus on sharing quality information each other so they could make better joint-decisions, improve the efficiency and effectiveness and built foundations for long-term partnerships that stays successful and rewarding over the years.

With the help of modern SCC platforms, supplier organizations and their customer organizations that are looking to create more value and enhance their competitiveness compared to what they could do on their own, will reach their goals. Manufacturing supplier organizations should also pay increasing amount of attention to digital supply chain and its practices and solutions, because according to the several reports, it offers incredible amount of potential for enhancing the productivity and visibility of supply chains. By implementing digital supply chain solutions into supply chains, also the collaboration of supply chain can jump into new dimensions.

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APPENDIX 1: Interview questions

Open-ended question:

1. What kind of collaboration systems are you using with your customers? (EDI, SRM-portals, extranets, e-mail etc.)

Barriers of supply chain collaboration:

1. Do you feel that there is a lack of collaborative strategic planning with your customers?
2. Do you think that the information is shared inadequately and inaccurately by your customers?
3. Do you feel that your customers are unwilling to share risks and rewards with your company?
4. Do you always understand the performance metrics that your customers are using in evaluation of your performance?