



**Vaasan yliopisto**  
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# **Quality cooperation between Finnish suppliers and case company**

Case study

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**ABSTRACT :**

The purpose of this work is to investigate the quality cooperation between the case company and some small Finnish subcontractors. The author doing the research works in case company. Company has recognized the need for such research. In many areas, differences of opinion have been noted regarding the impact of cooperation and communication on quality. The focus is to be more on the subcontractors' point of view

The theory section explores the background by examining literature on the dynamics and enhancement of collaboration, quality development in the context of the case and possibly on communicating in a hierarchical environment.

The empirical part was done by face-to-face interviews. Interviews were conducted with four Ostrobothnian companies. Two people from each company were interviewed. Interviews will be recorded and then analyzed. Also, two people from two departments of the case company will be interviewed to get case company's perspective on comparison. There is also a lot of quality data available from the case company that can be compared to the answers received.

According to the results of the study there are some differences between current status of quality perspective between case company and suppliers and cooperation can be made working smoothly and effectively between company and small Finnish suppliers.

In the future, it could be explored how possible changes occurring in this work affect the atmosphere and effectiveness of cooperation.

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**KEYWORDS:** laatu yhteistyö, laadun parantaminen, alihankinta verkoston hallinta, total quality management.

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**TIIVISTELMÄ :**

Tämän tutkimuksen tarkoitus on tutkia laatu yhteistyötä tutkimuksen kohteena olevan yhtiön ja joidenkin sen pienten Suomalasten alihankkijoiden välillä. Tutkimuksen tekijä on töissä tutkittavassa yhtiössä. Yhtiö on tunnistanut tarpeen tämän kaltaiselle tutkimukselle. Monilla osa-alueilla on havaittu näkemyseroja koskien yhteistyön ja kommunikaation vaikutusta laatuun. Tutkimuksessa keskitytään enemmän alihankkijoiden näkemykseen laatu yhteistyöstä.

Teoreettisessa osassa tarkastellaan taustaa tutkimalla kirjallisuutta yhteistyön dynamiikasta ja tehostamisesta, laadun kehittämisestä tämän tapauksen yhteydessä ja mahdollisesti viestinnästä hierarkkisessa ympäristössä.

Empiirisen osuuden haastattelut on toteutettu kasvokkain. Haastattelu tehtiin neljässä pohjalaisyriyksessä. Kaksi työntekijää joka yhtiöstä on haastateltu. Haastattelut on nauhoitettu ja tämän jälkeen analysoitu. Myös kaksi ihmistä tutkittavan yrityksen eri osastoilta on haastateltu, jotta on saatu yrityksen näkökulma mukaan vertailuun. Tutkittavassa yrityksessä on myös paljon dataa saatavilla vertailtavaksi haastatteluista saatuihin tuloksiin.

Tutkimuksesta saatujen tulosten valossa on havaittavissa joitakin näkemys eroja laadun tilasta yhtiöiden välisessä laatu yhteistyössä. Keinoja yhteistyön sujuvoittamiseksi ja tehostamiseksi yhtiöiden välillä on löydetty.

Tulevaisuudessa voitaisiin tutkia miten tämän tutkimuksen yhteydessä löydetty muutokset vaikuttavat yhteistyön ilmapiiriin ja tehokkuuteen.

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**AVAINSANAT:** laatu yhteistyö, laadun parantaminen, alihankinta verkoston hallinta, total quality management.

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## Abbreviations

SCC	Supply Chain Collaboration
B to B	Business to Business
QM	Quality Management
AQL	Acceptable Quality Level
ISO	International Organizations for Standardisation
QMP	Quality Management Principles
TQM	Total Quality Management
CIQ	Continuous Improvement of Quality
EFQM	European Foundation for Quality Management
SCQM	Supply Chain Quality Management
SCM	Supply Chain Management
SQM	Supply Quality Management
ERP	Enterprise Resource Planning software
ASCC	Advanced Supply Chain Collaboration
IMS	Information Management System
MSP	Managed Service Provider
OTD	On Time Delivery
PPM	Parts Per Million

# 1 Introduction

In this chapter the background of the thesis is revealed. Also, the scope and the structure of the thesis are presented. Due to specific nature of the research by the case company some limitations exist and are presented. This research is strongly based on case study and there for takes place studying specific quality subject determined by case company. There are lot of great studies revealing key quality theories which are used as a source in this study.

Since the cooperation term is used in this work it is good to open the meaning of the word in this context. Cooperation is more than an explanation of working together found in a dictionary. Usually in studies, different patterns of working together are described by the term collaboration. Collaboration is good term to describe subscriber supplier work towards same goals, but it is somehow more common than cooperation. Good way to internalize the idea behind cooperation is to think work towards same goal between individuals, usually, it is not called collaboration but cooperation because its intimacy. When this idea of intimacy is tough between companies we are somewhat near of basic idea of cooperation. Rachel Carman (2013) provides great universal description of cooperation stating: *cooperation is choosing to work with others and not insisting on my way.*

## 1.1 Background of the thesis

Today, as global competition intensifies and globalization accelerates, companies must keep up with competition and growth by, for example, finding new suppliers for their components from all over the world. As a result, the repertoire of subcontractors is growing all the time. There are big and sometimes very small subcontractors. Working in this field can sometimes be challenging and bring its own problems to quality.

In the case company of this research quality issues between suppliers and company has been recognized. Many times, when quality problems are detected it is found out that

the root cause has something to do with cooperation and communication between company and supplier. Sometimes the size difference between company and supplier can be huge and this can be seen as differences of opinion on quality assurance and investing on quality. People working in the interface of the supplier and case company have noticed some signs of quality difficulties in this area. Also, silent signs from supplier side of the interface has appeared.

There are lot of researches made from the area of supply chain collaboration (SCC). Collaborative practices in supply chain can be described like for example in Botta-Genoulaz et al. (2010) book where they are described as practices that enable independent members of supply chain to work together to plan and execute operations when they consider that this collaborative effort has an impact on actual performance. Also, there are researches on quality management in supply chain but usually they concentrate on the whole chain given results on using quality tools and managing methods.

In this research the interest is in between the case company and four small Finnish supply companies. And more specific in quality cooperation from suppliers' point of view. Author of this research works in case company quality department in interface of suppliers and case company. From time to time so called silent messages, meaning unrecorded information, from suppliers' side is received and the message of that information is telling there are many issues and areas bothering on suppliers' side of cooperating.

In B to B industry it is quite often forgotten that as company is trying to solve problems with their suppliers some of the answers could be found from their aftersales department. Meaning the company itself is someone else's supplier and in that way part of the supply chain. A lot more cooperation between companies' departments would be appreciated.

It could be said that the main trigger for this research is to give suppliers voice more relevancy and to understand cooperation more from that perspective. Especially, case



company being large multinational company, some might suggest supplier voice is not heard enough.

## 1.2 Scope

The focus is on investigating quality cooperation between case company and four small local supply companies in Finland. And even more precisely, the suppliers' point of view is at the heart of the research. Research is qualitative and suppliers are investigated by semi structured interviews. The interviews are conducted with four subcontractors. Two persons from each company are interviewed. Also, two persons from case company's quality- and purchasing department are interviewed to give perspective on differences of opinion. Purchasing is only involved on quality's point of view. Price policy and supplier bid competing is limited out of this research.

There have been signs of differences of opinion in case company's and suppliers' opinions on quality issues. Not direct disagreements but different approaches to various quality problems. Also, there are signs of differences on emphasis of quality areas between suppliers. So, there is need to get better understanding and overall picture on the state of quality between case company and these four suppliers. There for the first research question is set as:

RQ1: What is the current status of quality perspective differences between case company and suppliers?

Interviews are semi structured, and the questions are set so that they can be answered personally. The intention of this kind of interview is to dig deeper in individuals' thoughts of cooperation and to get them speak more freely. The interviews are recorded and then write up to make it easier to compare them to each other. These interviews are important on proses to get answer to second research question:

RQ2: How to get cooperation working smoothly and effectively between case company and small Finnish suppliers?

To get more understanding and to support the findings of these interviews the literature research is made on the area of quality. Studied researches are limited to areas of cooperation, quality improvement and communication in hierarchy. Communication in hierarchy is studied because there is suspicion of difficulties in communication because of size difference and competition situation between suppliers.

### **1.3 The structure of the thesis**

The basis of this study is case company's need to get better understanding of quality issues rising from supplier cooperation. For that reason, the thesis is structured as follows.

In the first chapter an introduction is made about the basis of this thesis. Most important thing effecting all the time is the very specific requirement from the case company's side to study just suppliers described in scope section.

Introduction chapter opens background and scope of the thesis as well as the research limitations. Second chapter focuses on literature which supports the subject of this study. Two sections of this chapter concentrate on literature from the areas of quality management and supply chain quality management. After that the knowledge and information sharing is studied. Final section of this chapter summarizes the literature studied in this chapter.

Third chapter reveals methods used in this thesis. There is section introducing case in this study as well as the method used. The supply companies under investigation in this study are generally introduced though the actual names are not revealed. Final section of this chapter explains the interviews used to get information from the companies.

## **1.4 Research limitations**

The research concentrates only on four Finnish nearby suppliers because the very specific information is considered to be most important in this thesis. In this case confidential face to face interviews are the best way to get this information.

It would be great to include more supply companies to this thesis but because of nature of the interviews it would require more time and resources to conduct that kind of a study. Hopefully findings from this thesis will give useful information to the case company but also to future researches to dig even more deeper on this subject.

It is known that there are researches studying supplier cooperation but most of those are done for large amount of companies by structured interviews in which answers are given for example by scale from one to five like in Likert scale. In those studies, there is no possibility to give any detailed explanations to answers.

The analysis is done based on the answers from interviews of supply companies introduced in this thesis and the literature reviewed. Information is very important to case company but also some suggestions can be made on more general level. Also, it has to be remembered that there are cultural differences in cooperation between countries. So, in this case findings are best relevant in Finland, but it would be great to compare this kind of researches from different countries.

## **2 Literature review**

In this chapter, theories related to this work's topic are investigated and presented. Also, in context of this work, the main subjects of quality in general are clarified. The chapter consists of four topics which are quality management, supply chain quality management, knowledge and information sharing and summary of literature review.

### **2.1 Quality management**

Quality management (QM) is a broad concept. It has a long history and during the years increasing number of methods and tools have taken place under it. In the following sub chapter, some of those are revealed. Quality itself is a constantly evolving phenomenon and for that reason it is usually preferred to study latest researches to get information that is on date. Nonetheless the main teachings and structures of quality management has always been the same. During the history there have been some great researchers like William E. Deming and Joseph M. Juran. These names come up in almost every thesis concerning quality in general. Also, for this work, teachings of these gentlemen are studied and referred.

Quality as a word can be used in many kinds of contexts. For example, people conversations, how people are talking to each other? How they express themselves? Are they "quality" speakers or is it hard to understand the key points they are trying to express? Or on the other hand is some large cruising ship working as expected. In his studies Garvin (1984: 25-43, 1988 39-48) has focused on researching different views of quality. He found four views which are: economical, philosophical, marketing and operational management. The economical school focuses on maximising the profit. The philosophical school focuses on conceptual questions of quality. marketing perspective is in quality as directing the purchase behaviour of consumers and customer satisfaction, and operational management concentrates on the methods of contributing quality and process controlling.

Many times, good quality has been used as advertising advantage. Of course, advertising is directed to consumers of the product or service. For that reason, it is useful to define quality from the “customers” point of view. At the end of the day customer defines quality and quality requirements. So, to manage quality, all the requirements need to be met. It is not easy to name one perfect expression for this and several authors have a bit different way to define quality. Most commonly used citations are:

- Fitness of purpose or use (Juran, 1980).
- The totality of features and characteristics of a product or service that bear its ability to satisfy stated or implied needs (ISO 8402, 1986).
- The total composite product and service characteristics of marketing, engineering, manufacture, and maintenance through which the product and service in use will meet the expectation by the customer by Feigenbaum (Oakland 1992: 2-3).

Crosby (1997: 73-83) gives more specific description for quality foundation with “four absolutes of quality”:

- Quality is defined as conformance to requirements, not just as goodness
- Quality is achieved through prevention not appraisal
- The quality performance standard is “zero defects” and is not defined by Acceptable Quality Level (AQL) which allow and build in acceptable levels of errors and inefficiencies
- Quality is measured by the price of non-conformance (Crosby 1997: 73-83)

So, one can see that there are many slightly different definitions of quality depending on author. It is important to be familiar with all different perspectives and ways to improve quality in different functions. It has often been observed that improving quality in one area could weaken it in another area. For example, complicated over quality product can make production difficult and cause low quality in meeting customer expectations

regarding delivery times. Understanding these different approaches help to understand the various views of quality the personnel has in different functions inside the company. Communication and understanding between persons in different levels of organisation are important for finding the mutual, united definition of quality. Quality will most likely not be improved if different views of quality will not be admitted inside the organisation.

A common citizen sees quality as a level which some service reaches or on how long some consumer product last in daily use and how easy it is to use. And that is of course main core of quality, but it requires many kinds of tools and methods to reach good quality on those areas. Quality management concentrates on things that helps to achieve daily good quality. Managing quality requires quality planning, assurance, control and improvement of both, processes and products (Rose 2005).

Oakland (1992: 7) states that quality management can be seen as philosophy and a batch of guiding principles which are the foundation of a continuously improving organisation, all the processes within the organisation, and the degree to which present and future needs of the customers are met. So, quality management is a way to continuously improve performance at every level of operation, in every functional area of an organisation using all available human and capital resources. It combines fundamental management techniques, existing and innovative improvement efforts, and specialised technical skills in a structure focused on continuously improving all processes. (Oakland 1992: 3-4.)

Due to variety of researches and books companies have had need for concentrated instructions and 'rules'. For that and many other reasons the ISO (International Organization for Standardisation) organisation was founded. Many companies all over the world relies ISO standards on Implementing quality management principles ((QMP)ISO 9000, ISO 9001) as well as on auditing their suppliers. ISO lists seven QMP's which are:

- QMP 1 - Customer focus

- QMP 2 - Leadership
- QMP 3 - Engagement of people
- QMP 4 - Process approach
- QMP 5 - Improvement
- QMP 6 - Evidence-based decision making
- QMP 7 - Relationship management

For all these seven principles there is description, explanation of importance of principle, examples of benefits and examples of actions to improve organizations performance. Especially for small companies which doesn't have resources to establish own 'retailed' quality management system ISO gives great opportunity to take quality management as a part of their processes.

In a company level and even in department level quality issues and emphasis are continuously changing. New problems are arising as old ones are solved. For that reason, quality needs continue managing. Principles like in ISO standards helps on recognising and focus on most effective areas.

### **2.1.1 Different perspectives of quality**

Today, there are many different perspectives defining the concept of quality. This chapter will reveal some of those. Quality in general and perspectives on quality can't be defined or described like in mathematics. There are not precise formulas for describing perspectives though formulas are used to analyse data for measuring quality. Perspectives on quality are a lot dependent on company's or consumers position on market. They have different 'modified' opinion on which perspective is determinative on that particular moment. However, there are widely recognised perspectives by famous authors. In outline, those perspectives have similar content.

Currently, many authors and studies approach quality from the customers point of view. That is of course understandable because at the end, customer is the one deciding the

product or service success on the market. Like Oakland (2000) writes: focus is on the customer: meeting and exceeding customer's needs. Of course, the ways on how to satisfy customer depends on industry and customer.

On the other hand, companies are in continuous comparison on relation between quality and product. Sales are lot dependent on characteristics of product. From that point of view good quality costs more. In turn, product defects have impact on costs because of scrap in production and final user errors. So, at the end one can argue that better quality cost less. This is dilemma which companies are trying to manage. Actually, Juran (1992) presented that there is no consensus in respect with what quality means, it is impossible task to combine these two perspectives in to one framework of unique definition. However, Juran (1992) identifies several features preferred by companies to define quality in respect of satisfying customer requirements:

- characteristics
- performance
- competing capability
- dependability
- quick response
- lack of errors
- conformity with standards and procedures. (Juran 1992)

All above features goes under Jurans expression of quality: Fitness of purpose or use (Juran, 1980). In a sense, that all these features need to be in correct relation in respect of customer requirements and producer interests.

Like said earlier, quality and perspectives of it is not simple task to determine because lack of structure and controversy. There are some great authors that have managed to define perspectives on quality in a way that companies use those in setting quality objectives. Garvin (1988) defined perspectives on quality:



- The transcendental perspective - although quality cannot be defined, you know what it is; in this view, quality is synonymous with excellence, is absolute, everlasting, and universally recognized; sometimes is identified with craftsmanship as the opposite to mass production; more often it cannot be precisely defined but can be learnt by experience; so, whatever is quality, people will learn to recognize it
- The user perspective - fitness for use (Juran 1974: 2-2); this perspective has led to the following approaches: aggregation of very diverse individual preferences in order to define quality at market level in a significant manner; determining a consistent positive correlation between the two key concepts: quality and customer satisfaction
- The product perspective - quality is a concrete, measurable attribute, given by the number of characteristics of a product / service; in this perspective, the best quality products / services will have the highest prices since each characteristic has its specific costs; furthermore, since quality reflects the presence or absence of certain measurable characteristics of a product / service, it can be objectively measured
- The producer perspective - the degree a product / service shows conformity with a project or specification (Gilmore 1974: 16); in this respect, quality means "right the first time"
- The value perspective - although very important, this perspective is difficult to apply because it comprises a mixture of two linked, but distinct concepts: excellence and value; it defines quality in a subjective, diffuse manner, as the excellence we can afford

By applying all these Garvins (1988) perspectives on quality companies can gain significant benefit by making clear picture on the quality on their operations. It helps to place resources on the right areas on the right time and that way find cost savings, market-share gains, and profit growth.

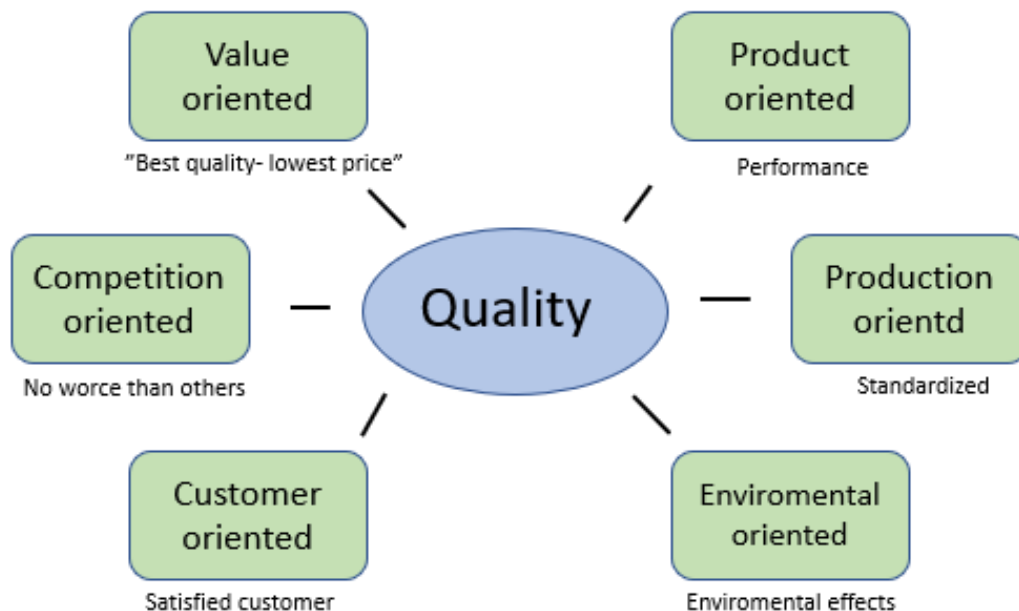
To get even more appropriate framework to evaluate and manage quality some of the most respected frameworks can be included to the notion of quality. Four of the most used frameworks are from the studies of Edwards Deming, Philip Crosby, Armand Feigenbaum, and Joseph Juran:

- W. Edwards Deming (1986) is perhaps the figure most widely recognized as operationalizing quality concepts and principles. He asserted that people achieve quality through never-ending efforts at continuous improvement. Improvement occurs as people eliminate unwelcome variation in a product or service, and they do so by eliminating variation in the process that creates the product or service. Deming's ideas were influential in the development of the ISO 9000 series of quality standards. His ideas align most closely with Garvin's product-based approach.
- Philip B. Crosby (1979) advocated for "zero defects" as the foundation of quality. "Zero defects" does not mean that a product or service must attain "perfection"; rather, the product or service must conform perfectly to the requirements agreed upon by the customer and the supplier. In other words, the customer deserves to receive exactly what the supplier has promised to produce. This approach fits well with what we are calling Garvin's "production-based approach." Some people might assume that this approach applies exclusively to product manufacturing, but the concept of zero defects applies to both products and services.
- Armand V. Feigenbaum (1983) argued that quality is the total composite of characteristics through which a product or service will meet the expectations of the customer in use. Feigenbaum's name is virtually synonymous with the term "total quality management." He stressed that quality means what is best for certain customer conditions that encompass the actual use of the product (or service) and its cost to the user. His view can be seen as aligning with Garvin's value-based approach.

- Joseph M. Juran (2010) stated succinctly that “quality is fitness for use” and that “fitness is defined by the customer.” According to this view, which is widely accepted across multiple industries, suppliers would be mistaken to decide what is or is not fit for the customer’s use. Juran’s position aligns most closely with Garvin’s user-based approach.

Though there is not exactly consensus on how to describe quality and its principles, with these four above frameworks with Garvin’s five principles one can get widely recognised notion on how to observe quality in organisation.

Today, people are getting more and more interested in environmental and nature protection issues. Though these focus areas can be seen included in older frameworks of quality some authors are giving environment and nature more emphasis. For example, Lilrank (1990) focuses on quality principles from company’s interest groups point of view giving more emphasis on environmental and competition orientation. Lilrank gives a clarifying figure on quality perspectives from the interest groups point of view in Figure 1



**Figure 1.** Different perspectives of quality (Adapted from Lillrank 1990:41).

### **2.1.2 Total quality management**

As earlier mentioned, sometimes quality can be hard to define in a way that suites all functions in company. Even if people inside the organisation are diligent and ambitious to make good quality the result of the operations can be something not acceptable from a quality point of view. This is because every individual has its own opinion of good quality and how to make it. Making good quality in some function may make it poor in some other function. For that reason, quality needs management in every level and persons to have led on it. Quality management has always had important role on defining companies' strategies on quality. But because of complexity of quality, it's existence in every detail inside manufacturing, there is need for more accurate managing. One can argue there is total quality management (TQM) for that. Of course, there are many different definitions made by recognized authors. And for TQM many companies have their own definitions to TQM in their quality programs. TQM has become very popular among the organization. In fact, when people are talking about Quality management, they can actually mean TQM and the other way around. (Oakland 2000)

For the success of TQM, total commitment of entire organisation is required, not only the top management. Every function of the organization has to participate on realization of TQM. No matter if one is employee or member of top management. So, successful implementing of TQM depends a lot from company's culture. People must recognise that they are part of the quality chains and processes. And they have to know the effect of their work to their co-worker's outcomes. (Oakland 2000)

When told many companies have their own retailed systems for managing quality and TQM, one has to remember that actually quality managing as phenomena is not founded by awarded authors but companies themselves. These great researchers have just studied all those different quality systems of many companies during the history and combining them to systems like TQM. Usually great inventions rice up from competition between companies and from economic interests. This has happened also with TQM, not

least when during post World WAR II period Japanese and American companies were competing to gain market shares by better quality. (Powell 1995)

When studying the literature of TQM, it can be found based on Japanese extensive quality control which was influenced by previous American quality experts. According to Schmidt and Finnigan (1992), the roots of TQM include:

- Scientific Management: Finding the best one way to do a job.
- Group Dynamics: Enlisting and organizing the power of group experience.
- Training and Development: Investing in human capital.
- Achievement Motivation: People get satisfaction from accomplishment.
- Employee Involvement: Workers should have some influence in the organization.
- Sociotechnical Systems: Organizations operate as open systems.
- Organization Development: Helping organizations to learn and change.
- Corporate Culture: Beliefs, myths, and values that guide the behaviour of people throughout the organization.
- The New Leadership Theory: Inspiring and empowering others to act.
- The Linking-Pin Concept of Organizations: Creating cross-functional teams.
- Strategic Planning: Determining where to take the organization, and how and when to get there. (Schmidt & Finnigan 1992)

When coming to 2010 decade the change in principles of TQM can be seen to move closer to customer-oriented thinking. Quality has riced to one of the key competition elements and consists whole customer experience from the offering to shipping. For example, Westscott (2013) has described 8 principles:

- Customer-focused: During previous era, managers are the one who decide the level of quality of the product. But in the end, customers are the one who is using the product or service, so they are the one who determine if the product or

service is good enough. This mean more emphasis must be placed onto customer if you want to achieve quality.

- Total employee involvement: Continuing the Total Quality Control approach where it requires all the workforce to aim toward a common goal, by giving powers onto employees' hands, it could increase their commitment and performances.
- Process-centered: Focus on step by step process thinking on how to produce a product or service and deliver it to customer and how to monitor process to ensure quality.
- Integrated system: Continuously improving the functions of organization with the aim to exceed the expectations of customers and the firms.
- Strategic and systematic approach: strategic planning on how to integrate quality dimensions.
- Continual improvement: always making changes in order to not fall behind.
- Fact-based decision making, datamining and analysis to achieve best results.
- Communication: effective exchanges between cross-functional teams should keep employees in check with all critical changes. (Westscott 2013)

When implementing TQM in their operations companies can use already existing frame works for evaluating quality status in the company and for how to start using TQM. So, there is no need to invent anything from the scratch. There exist some award-winning criteria to evaluate quality status and some famous authors perspectives to help in TQM.

Baldrige Award Criteria is used to evaluate quality. It gives clear picture of the current status of the quality by given points from each category having effect on quality. Baldrige award criteria contains 7 major criteria's which are divided into more specific sub criteria.

1. Leadership (90 points)
  - 1.1. Senior executive
  - 1.2. Management for quality

- 1.3. Public responsibility
2. Information and analysis (80 points)
  - 2.1. Scope and management of quality and performance data
  - 2.2. Competitive comparisons and benchmarks
3. Strategic quality planning (60 points)
  - 3.1. Strategic quality and planning process
  - 3.2. Quality and performance plans
4. Human resource development and management (150 points)
  - 4.1. Human resource management
  - 4.2. Employee involvement
  - 4.3. Employee education and training
  - 4.4. Employee performance and recognition
  - 4.5. Employee well-being and morale
5. Management of process quality (140 points)
  - 5.1. Design and introduction of products and services
  - 5.2. Process management-production and delivery
  - 5.3. Process management-business and support
  - 5.4. Supplier quality
  - 5.5. Quality assessment
6. Quality and operational results (180 points)
  - 6.1. Product and service quality
  - 6.2. Company operations
  - 6.3. Business process and support services
  - 6.4. Supplier quality
7. Customer focus and satisfaction (300 points)
  - 7.1. Customer relationships
  - 7.2. Commitment to customers
  - 7.3. Customer satisfaction determination
  - 7.4. Customer satisfaction results
  - 7.5. Customer satisfaction comparisons

## 7.6. Future requirements and expectations (George 1992)

Perhaps three of the most used criteria are from authors Deming, Juran and Crosby. Though their perspectives are not identical, with the guidance of these, companies can find the best way to implement TQM in their operations. It is easy to find very specific information from the literature to these perspectives when needed in implementation of TQM. Deming (Walton 1986) describes 14 points as follows:

1. Constancy of Purpose
2. Adopt the Philosophy
3. Don't rely on mass inspection
4. Don't award business on price
5. Constant improvement
6. Training
7. Leadership
8. Drive out fear
9. Break down barriers
10. Eliminate slogans and  
1. exhortations
11. Eliminate quotas
12. Pride of workmanship
13. Education and retraining
14. Plan of action. (Walton 1986)

On the other hand, Juran (1992) gives his perspectives in a trilogy as follows:

- I. Quality Planning
  - Set goals
  - Identify customers and their needs
  - Develop products and processes



- II. Quality control
  - Evaluate performance
  - Compare to goals and adapt
- III. Quality improvement
  - Establish infrastructure
  - Identify projects and teams
  - Provide resources and training
  - Establish controls. (Juran 1992)

And Crosby (1979) defines his perspectives as 14 quality steps:

1. Management commitment
2. Quality improvement teams
3. Quality measurement
4. Cost of quality evaluation
5. Quality awareness
6. Corrective action
7. Zero-defects committee
8. Supervisor training
9. Zero-defects day
10. Goal-setting
11. Error cause removal
12. Recognition
13. Quality councils
14. Do it over again. (Crosby 1979)

As noted, every author has slightly different criteria. For example, Deming has more focus on Statistical quality measures. An exhaustive review and integration of the TQM literature suggests that complete TQM programs tend to share the 12 factors shown below (Powell 1995):

1. Committed leadership: a near-evangelical, unwavering, long-term commitment by top managers to the philosophy, usually under a name something like Total Quality Management, Continuous Improvement (CI), or Quality Improvement (QI).
2. Adoption and communication of TQM: using tools like the mission statement, and themes or slogans.
3. Closer customer relationships: determining customers' (both inside and outside the firm) requirements, then meeting those requirements no matter what it takes.
4. Closer supplier relationships: working closely and cooperatively with suppliers (often solesourcing key components), ensuring they provide inputs that conform to customers' end-use requirements.
5. Benchmarking: researching and observing best competitive practices.
6. Increased training: usually includes TQM principles, team skills, and problem-solving.
7. Open organization: lean staff, empowered work teams, open horizontal communications, and a relaxation of traditional hierarchy.
8. Employee empowerment: increased employee involvement in design and planning, and greater autonomy in decision-making.
9. Zero-defects mentality: a system in place to spot defects as they occur, rather than through inspection and rework.
10. Flexible manufacturing: (applicable only to manufacturers) can include just-in-time inventory, cellular manufacturing, design for manufacturability (DFM), statistical process control (SPC), and design of experiments (DOE).
11. Process improvement: reduced waste and cycle times in all areas through crossdepartmental process analysis.
12. Measurement: goal-orientation and zeal for data, with constant performance measurement, often using statistical methods. (Powell 1995):

Implementing TQM to companies managing culture is large task to handle but with all principles and methods presented, and many more, it can be done. Though, many different principles may feel confusing, on the other hand it gives companies the possibility to study their status of quality and to make TQM system best suitable for their operations. Quality is continuously evolving phenomena and in everyday operations it needs continuous monitoring and improvement. At least in some level every company needs TQM actions even if it employs just one person.

### **2.1.3 Continuous improvement of quality**

Like said, quality is constantly changing phenomena. For an individual company it can for example mean that it must continuously monitor competitors' level of quality and customer quality appreciation or perhaps making radical changes to products. So, from the company point of view, improvement of quality is endless task. Continuous improvement of quality (CIQ) is important part of quality management and many authors include it into definition of the quality management. Like written earlier in the thesis, Oakland (1992: 7) puts it very well together stating quality management can be seen as philosophy and a batch of guiding principles which are the foundation of a continuously improving organisation, all the processes within the organisation, and the degree to which present and future needs of the customers are met. So, quality management is a way to continuously improve performance at every level of operation, in every functional area of an organisation using all available human and capital resources. It combines fundamental management techniques, existing and innovative improvement efforts, and specialised technical skills in a structure focused on continuously improving all processes.

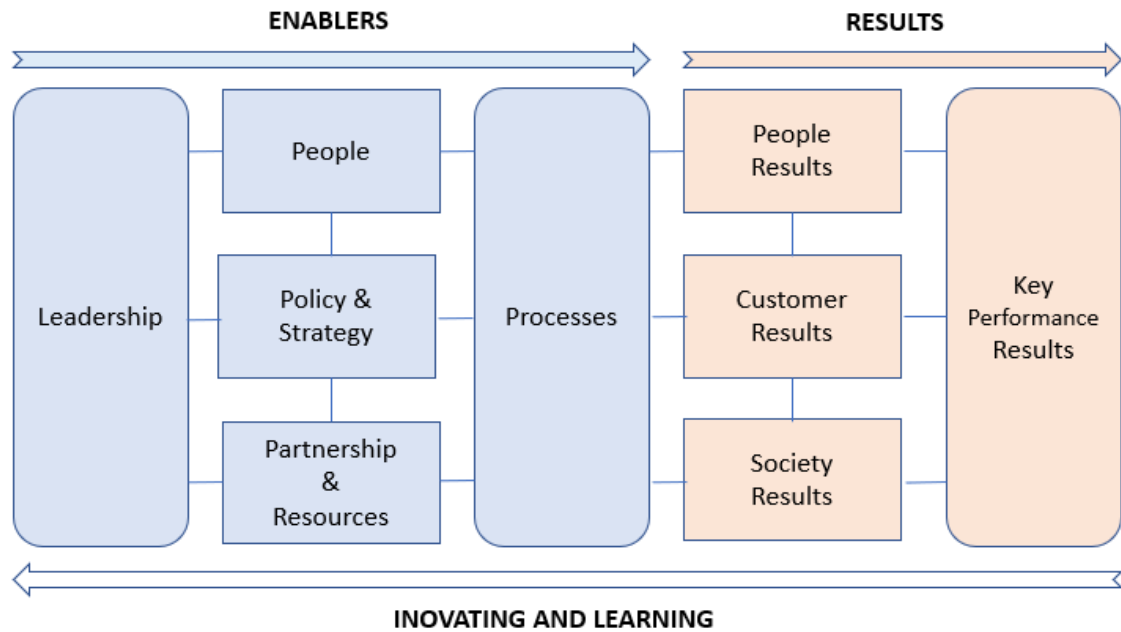
So, it can be said that improving quality is improving every activity and product inside the organization. One of the main focuses of researchers in the QM and TQM is to find models to continuous improvement. There are a lot of researches on this area and terminology might vary between authors, but the main foundation and tools are usually the same. And when the studies are done for unique companies the models can vary.

When companies include quality in their strategies usually focus is on TQM and in that way continuous improvement of quality. When seeking information on CIQ, big range of quality processes and studies can be found. There are lot of quality standards and processes to accompany them. For example, there are some focusing very closely to quality measuring and some focusing more on quality guidelines without strict measuring. One of the first things to decide is whether focus is on the improving quality and gaining customer value or just keeping prevailing level of quality and to fulfil legislation and standards. Of course, today all the companies can be said to be forced on CIQ to survive in never stopping competition on market. So, companies must find their own road map to CIQ and for that there can be found many tools and models from the literature.

One of the most common method to approach CIQ is European Foundation for Quality Management (EFQM). In the heart of this model, like every other model, is of course the idea of feedback and learning from the downstream of proses. Product or service is never ready, there is always something to do better. Information and learning circulate in value stream starting from leadership to customer results.

The EFQM was formed in 1988 by fourteen leading European businesses as an instrument for increasing competitiveness using TQM philosophy. The model and the associated self-assessment process have given new direction to the quality movement and have driven deep and lasting changes into participating organizations.(Dale 2000)

The EFQM Model is structured in nine basic criteria (Figure 2), five at an enablers level and four at a results level. Those criteria allow the evaluation of the position of an organisation referring to excellence. Each of them is defined globally and is then structured in a variable number of sub criteria (Martín-Castilla 2002).



**Figure 2** EFQM Excellence Model (Adapted from Martín-Castilla 2002).

The main principles of the EFQM Excellence Model are as follows:

1. results orientation,
2. customer focus,
3. leadership & constancy of purpose,
4. management by processes & facts,
5. people development & involvement,
6. continuous learning, improvement & innovation,
7. partnership development, and
8. corporate social responsibility. (Committed to Excellence Information Brochure 2005, p. 14):

The firms with a higher level of quality in all the criteria of the EFQM Excellence Model obtain better results whereas firms with the lowest scores in all of the variables obtain the worst results. (Garíca-Bernal 2003). And Grant (2003) state that The EFQM Excellence Model is a suitable instrument for self-assessment as the basis for continuous improvement.

For the purpose of implementing and maintaining CIQ many tools and methods are found. Every part of models like EFQM needs tools for example measuring quality and to manage and monitor proses of continuous improvement. Like in all areas of quality, the CIQ methods are widely researched area. Depending of continent, country and author there are plenty of methods and one have got to pic most suitable for own needs.

Just to name some methodologies many have heard about Lean, Deming's system of profound knowledge, The Improvement Model Framework Continuous Process Improvement, Six Sigma and the PDCA cycle. There are a lot of literature on these methodologies and now it is intention to open a little bit some of those.

Firs of all, coming from the TQM point of view, the continuous improvement is one of the core components. Murray (2019) writes that one way to approach improvement especially the business side in mind is the way which include:

- Process mapping
- Root cause analysis
- The Plan Do Check Act (PDCA) cycle

Proses mapping is to get accurate understanding of the process that has been identified for improvement. The process can be in any part of a company's business but must be able to be mapped to identify the flows that make up the process. The physical flow as well as the information flow needs to be documented. The benefit that the process map gives to providing continuous improvement is that it defines the scope of the process, the interface with other processes, and a starting point from which improvement can be measured against (Murray 2019).

Root cause analysis is to determine the root cause of a problem, incident, or quality concern. Root cause is identified by three steps which are data gathering, analysis and

validation. And three phases that make up the proses. In open phase all participant brainstorms to get as much as possible root causes, in narrow phase team reduces root causes to most effective ones and discusses in more depth to determine if they should be kept and in closed phase team must come to a consensus on a root cause. This will involve validating the root cause based on evidence, whether that is using measurable data or subjective evidence from interviews with staff, customers, or vendors (Murray 2019).

Plan Do Check Act (PDCA) cycle is a simple approach for carrying out change. It was developed by W. Edwards Deming and it consists of four phases; plan, do, check, and act. Shortly it can be explained as:

- Plan: Identify and analyse problem
- Do: Develop and implement solution.
- Check: Gather and analysing data on the solution. Evaluate the results.
- Act: Implement the full-scale solution and capitalize on new opportunities.

This approach is simple, and many companies uses it for that reason, and also, it is easy to implement and does not necessary require lot of resources.

The other methodology that needs to be raised up is Lean methodology. When studying literature, it seems to pop up all to time. In recent studies Lean methodology seems to be most popular one. And the overall feeling from the business field tells that it is the one everybody is choosing to their companies. There are a lot of consultants selling their services to implement Lean.

Main idea of Lean is to eliminate all kinds of waste in organizations proses. For example, one waste being scrap, which can be result of poor quality. Lean consists of many concepts like value and people involvement. Quality is of course present in all concepts but specially in continuous improvement. For reducing waste and to realize these concepts

there is many tools and methods listed in Lean. Some to mention, Quality at the source and Kaizen.

Kaizen is Japanese word to continuous improvement. Kaizen is a method that strives toward perfection by eliminating waste. It eliminates waste by empowering people with tools and a methodology for uncovering improvement opportunities and making change. Kaizen understands waste to be any activity that is not value-adding from the perspective of the customer. Waste consumes resources and people implementing wasteful processes are themselves wasted. When constrained to execute these imperfect processes without the opportunity to make them better, people are denied the exercise of their capacity to learn and improve and thereby grow to the full measure of their capabilities. (Gupta 2015)

## **2.2 Supply chain quality management**

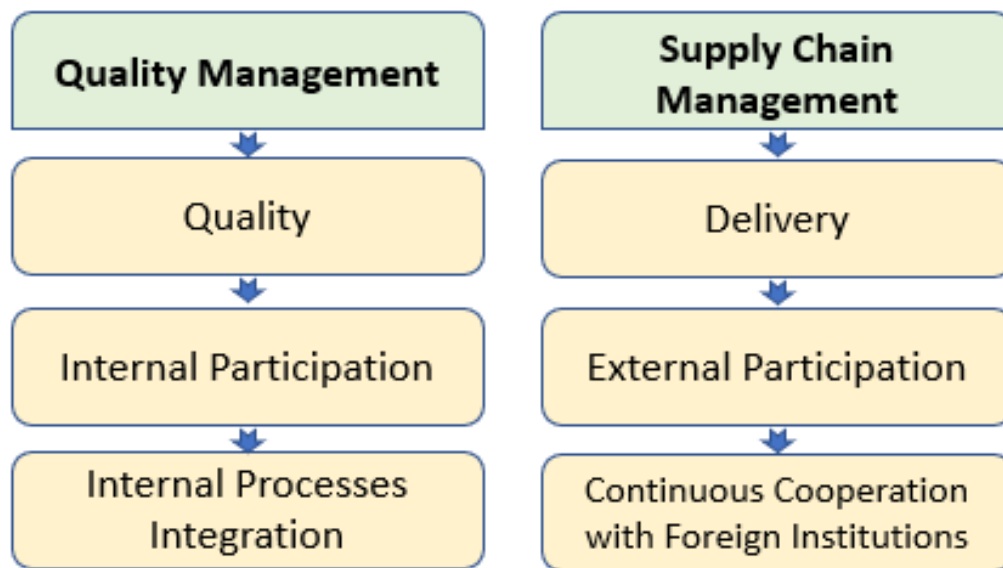
As discussed earlier, quality is involved in every step of company's processes from start to finish. Companies are making big investments to implement and develop quality and there is always something to do better or to repair. Nowadays companies are more and more focusing on their core businesses meaning they don't make their product or services from start to finish. Many parts of manufacturing are outsourced to suppliers, only the components that make the product unique may be manufactured by the company. Or there could be workers from many different firms in same factory or site doing work under the same company. Like Waller (2004) states manufacturing and service companies cannot be considered as independent actors on the market anymore, because their production output is greatly dependent on their supplier's performances. So, one can see that it increases the issues to consider in quality management, when there are many companies in supply chain. Companies might have different quality systems in use, or they could have different opinions about the primary quality issues. Still, every player in quality chain needs to have their share from the profit, other vice the supply chain is not vital. It is clear that cooperation between companies is lifeline for supply chain quality



management (SCQM). And every company in chain must have clear goal of delivering the value to final customer like Cormigan et al. (2007) writes, manufacturing organisations should focus attention on their suppliers' performances to be able to protect their final customers' needs.

Like other areas of quality, SCQM has raised the interest of researchers and there are many great studies from this subject. Perhaps the challenge of cooperation is the trigger for interest. Some researcher may even see room for interdisciplinary study because companies could be seen as individuals like humans. Every cooperation relationship is different and at the end there are humans doing the intercourse.

it could be said that starting point for SCQM in companies is the one where there is strategy for supply chain management (SCM) and for total quality management. Many times, both managements are dealing with the same quality issues. There for the SCQM strategy is necessary. Both, TQM and SCM act for meeting customer satisfaction. They only differ in terms of their approach and models used to meet this purpose. Total quality management focuses on quality, and supply chain management on the delivery as the basis for the cost price of products. However, it must be noted that higher quality and more appropriate deliver will lead to customer satisfaction and improves competitive power of the organization (Gunasekaran & Ngai, 2004). In brief, it can be said that TQM mainly operates internal in companies focusing strongly on quality issues, while SCM has mainly external operations focusing on on-time services. Differences in QM and SCM are shown in Figure 3 (Kannan & Tan, 2005).



**Figure 3** Differences between QM and SCM (Adapted from Kannan & Tan, 2005).

So, defining SCQM, SCM and TQM needs to be known and defined. The literature of TQM philosophy was introduced earlier in this study, but to compare these two philosophies it is good to place short definitions of both side by side like Mahdiraji (2012) does in his study. Figure 4.

Total Quality Management	Supply Chain Management
A managerial philosophy focusing on the integration of all levels, and emphasizing organizational activities, continuous improvement, quality of goods and services, as well as customer satisfaction.	A managerial philosophy focusing on the integration with extra-organizational members in the supply chain, and emphasizing the needs of customers, on time delivery of goods and services, as well as customers' satisfaction.

**Figure 4.** Comparison of TGM and SCM (Adapted from Mahdiraji 2012)

After these philosophies are defined and studied the SCQM can be defined. Kuei and Madu (2001) have find visual way to define SCQM, in which the words of the whole term

are defined in form of the parts of an equation, in order to define the total term supply chain quality management by their combination. This definition is shown in Figure 5.

item	Parts	Definition
1	SC	A production network up to the phase of distribution
2	Q	Appropriate meeting of market demand, rapid customer satisfaction
3	M	Providing conditions and increase in confidence for the improvement of supply chain quality

**Figure 5.** The Definition of Supply Chain Management (Adapted from Kuei and madu 2001)

As said, company is positioned as one part of the supply chain and there for it must be concerned and interested in other parts of the chain. Of course, managing of quality upstream towards suppliers is important to maximize received quality but also, downstream towards customers to maximize customer satisfaction and to maintain market position. Benaisa (2010) states that supply chain quality management is official coordination, integration of business processes, of all organizations that are members of a supply network for measurement, analysis, and continuous improvement of products, services, and processes to create value and achieve the satisfaction of all middle and end users of markets. If the supply chain is thought from the end customer perspective, it is just one of the possible alternatives to deliver goods for its needs. There could be tens of supply chains behind its suppliers and in the end, it purchases the product of the whole supply chain. So, it is vital for every company in chain to manage quality internal and external. Successful managing of supply chain requires cooperation of all parts of chain and there needs to be understanding of importance of all participants of chain. Mahdiraji (2012) states it leads to better and low-priced products, shorter time for accountability, and higher service-providing levels. For this purpose, supply chain network is defined as a set of networks of interconnected organizations that are ready to meet rapidly the needs and expectations of customers.

### **2.2.1 Supplier quality management**

When talking about supply chain quality management, companies are thinking the whole net of suppliers delivering goods and services to them. Companies must make plans and strategies on how to manage whole chain. There must be guidelines to manage issues rising from the chain starting from the supplier selection all the way to billing systems. Usually there are many different supply chains in which company is part of. SCQM gives guidelines to manage individual supplier quality in supply chain. There must be strategy on how and what kind of level of quality company is demanding from its suppliers.

Companies top managements main interest is of course, satisfying customer needs and that way bring best possible profit to firm and its shareholders. To get best out of organizations companies need to maximise organizations performance. Supplier quality management (SQM) has big impact on organizations quality performance. SQM comprises set of activities determined by management depending on which are the company's interest on quality performance in that particular time. Such activities include measuring and tracking the cost of supplier quality, using performance-based score cards to measure supplier performance, conducting supplier audits and establishing effective communication channels with suppliers among many more, with an aim of achieving customer satisfaction (Carr 1999). Forker (1999) argues that the impact of supplier quality on an organization's performance is large and direct, and the general understanding is that a firm's quality performance (output) can only be as good as the quality performance of its suppliers (input). There is phrase in sports that the team is as good as its weakest link. In SQM, same kind of thinking is one of the major matters. Company wants its supplier to perform at the same level as itself. Also, company is interested on how supplier's supplier is performing. For example, supplier audits are good tool for monitor how supplier is managing quality towards their vendors. In fact, Yeung (2002) view SQM in terms of the managerial efforts necessary for creating an operating environment in which a manufacturer can integrate its supplier capabilities into its operational processes. Supplier

audits are one of these efforts, like also, management responsibility, supplier selection, supplier development, supplier integration and quality measurement.

Depending on company's position in supply chain, there are different approaches to supply chain management. Despite of company's position in supply chain or what size company is there are supplier quality management practices they like to use. Of course, smaller companies don't have lot of resources to invest in SQM resources. And usually their position is at the beginning of chain and they don't have many suppliers. On the other hand, large, many times multinational companies are willing to invest on supplier quality management. For example, they usually have very professional supplier quality manuals. With these manuals companies are trying to get the main message of their vision and mission to every part of supply chain. There could be slightly different manuals to suppliers and to company's own organizations. Inside the organization information on how to evaluate suppliers is important and for suppliers it is important to know what the expectations towards them are. There are several SQM practices which can be defined as follows:

Supplier monitoring is needed for maintaining effective relationship between company and its suppliers. Maundu (2016) states that firms need to monitor performance of their suppliers to ensure that they conform to the set of the buyer. The entity ensures that the supplier modifies their managerial behavior and aligns their relationship to operational and strategic goals of the buyers. By monitoring suppliers' performance, decision makers get essential information that helps them to plan, direct and control the activities of the organization. According to Kochhar and Saeed (2012), purchasing managers have a responsibility of monitoring supplier performance.

Supplier performance measurement is needed for analyzing performance and to make sure suppliers are keeping their side of business agreements. Also, it is important to keep records of data to improve and compare suppliers. Trent (2014) explains that the information which is collected by monitoring is utilized to analyze and assess all the required

elements of the firm or a department to measure its level of effectiveness and adjust inputs where needed.

Competitive supplier selection means that company has to evaluate suppliers to make decision which one or ones are those to cooperate. there are different tools and mechanism to help selecting suppliers, for example bids negotiations or reverse auctions. According to Kochhar and Saeed (2012), supplier selection serves as one of the most imperative decision-making aspect because selection of the right suppliers leads to a significant reduction of the purchasing costs and this gives the organization a competitive edge. Company's mission has to be clear because there are always same tradeoffs to make when selecting between things which are not straight-ahead comparison valid. in this case cost and quality can be different in suppliers' offerings.

Supplier audits are important to company for keeping track on supplier's quality operations. By auditing suppliers' company can help to improve supplier's quality and to notice areas producing poor quality. Nowadays, the trend is more on focusing cooperation rather than pointing out bad things. Like Sculli and Yeung states (2012), Supplier audits helps to detect weaknesses within the supply Chain with a strong emphasis on supplier corrective and preventive actions as well as maintenance.

Supplier development is important for finding issues to improve in a way which benefits whole supply chain. For example, there could be issues in suppliers processes to be done more effectively or with less materials. With this change supplier can make products cheaper and company can then by components cheaper. Then in the end customer prizes can be lower and gain more market shares to company because of lower prices than competitors. Also, today it is increasingly more common to have joint product development project with suppliers. The special knowledge of suppliers is used to make company's product more durable and effective. This kind of joint processes requires strong cooperation, information sharing and risk sharing. Quayle (2000) states that supplier development should be about partnership, where both customer and supplier are

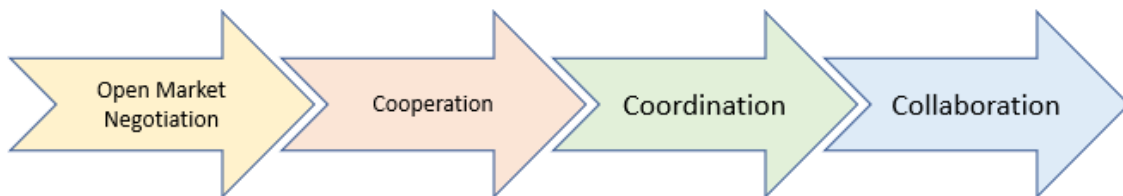
committed to working together for the long-term benefits. And Moncka (1993) writes that supplier development is also about recognition and awards, the promise of future benefits, training and education of the supplier's personnel and exchange of personnel between the buying firm and the supplier.

Supplier integration focuses on developing collaboration between companies. Suppliers are more commitment to company if their voice is heard, for example in development projects. Especially for supply chains which are making products that are advertised with high quality it is important to engage suppliers to same goal of high quality. Like many other quality related issues also supplier integration has spread from Japan to everywhere else. Andrew (1994) writes that suppliers working closely with customers during new product development activities are the norm for successful Japanese companies, and this typically applies to all suppliers. Today, it is simply necessary to use supplier integration to gain competitive advantages. Melissa (2004) writes that supplier involvement ranges from simple consultation on design ideas to making suppliers fully responsible for the design of services they will supply. Benefits of supplier integration can be for example reduced lead-times i.e. product development, improved communication, significant costs savings from improved productivity, improved financial performance, trustworthy products with fewer recalls and a reduction in complaints from customers (Kochhar & Saeed, 2012).

All these practises are effective on SQM. But it tends to be so that after the SCM planning there is risk of sub-optimization and organizations are more likely to use practises that are cheapest and on the other hand purchasing organizations are not willing to invest on quality management. So, it requires strong leadership from the top management of company to get all participant involved.

### 2.2.2 Supply chain collaboration

Earlier in this study, for example quality management, supply chain quality management and supplier quality management have been defined. There are many different forms and principles with which different dimensions of quality can be clarified like for example Westscotts (2013) 8 principles of TQM defined earlier in this study. In all these earlier defined practises, the collaboration is present. In some researches the term cooperation is used with or instead of collaboration, though some argue collaboration is formed from cooperation. In fact, Stein (1982) writes that, Collaboration practices, such as supply chain integration or joint planning, are evolved from coordination which developed from cooperation and open market negotiation. This kind of evolution form is shown in Figure 6. But nevertheless, some kind of working together or information sharing is included in all practises. If not cooperation between the companies then perhaps between the departments of company or between people inside the company. Cooperation has always been there, but today, it has become more and more recognized to be one of the most effective dimensions in all company practises.



**Figure 6.** Transition of collaboration (Adapted from Spekman 1998)

Today, supply chain collaboration (SCC) concept is widely recognized. Of course, cooperation has been needed from the beginning of the trade market but nowadays concept is in use at all companies and the effects on company performance is known. Positive effect can come for example via operation flexibility or cost reduction. These effects can be instant or long-term effects. All organisations are admitting, that in today's business, it is not enough to just improve efficiency inside the company. Paradigm is that all organizations in supply chain must be made competitive. (Mathuramaytha 2011). There are many different forms of cooperation recognized. Collaboration may share large



investments, pool risks, and share resources, reasoning growth and return on investments (Guglar 1993).

Simatupang (2002) writes that, SCC is often defined as two or more chain members working together to create a competitive advantage through sharing information, making joint decisions, and sharing benefits which result from greater profitability of satisfying end customer needs than acting alone. At the end, in the business environment all leads to making profit. Making profit is the main driving force to SCC. In his book Ireland (2004) writes: Companies are increasingly looking beyond their individual enterprises to find ways to increase sales revenue and profit margins. In today's business world, there is an increased focus on the effectiveness of the supply chains. Ineffective supply chains are increasingly being "money pits" that strip enterprises of cash flow when inventory is not needed and, on the other hand effects on sales revenue when product is not available to sell. As a result, new business models are being developed to leverage and improve supply chain performance.

Clear way to categorize collaboration is to split it to three dimensions like, for example, Simatupang (2004) does refer as follows:

- Information sharing refers to the act of capturing and disseminating timely and relevant information for decision makers to plan and control supply chain operations.
- Decision synchronisation refers to joint decision-making in planning and operational contexts.
- Incentive alignment refers to the degree to which chain members share costs, risks, and benefits. (Simatupang 2004)

Benefits from this collaboration can come for example through:

Improved operational performance when outcomes can include a better level of responsiveness and service level improvements from the supply-chain collaborative programmes (Holweg 2005). Actually Wilding (2006) states that by working with supply chain partners, firms are expected to multiply the outcomes of the effort from working alone.

Increased quality when companies share information on issues effecting on component or service quality. Holweg (2005) writes that the performance of firms is heavily reliant upon accurate and timely information in the supply chain. Also, supply chain associated costs like inter-firm transactions, inventory and production can be reduced (McLaren 2002).

Improved logistics cost when companies can make joint settlements about transportation, including for example packaging materials and carrier selection. This have effects on e.g. order fill rates, product available on the shelves or retail stock-out and on deliveries during peaks of high demand (Simatupang 2005).

Mitigated risks when the collaboration reduces gaming and rationing in the supply chains and that way eliminates demand variability amplification “bullwhip “effect (Holweg 2005).

On the other hand, benefits from the collaboration comes with costs of implementing and maintaining collaboration. Costs are direct and indirect, and companies have to weight benefits and costs of collaboration when making decisions on level of collaboration. For example, Information and communication technology such as Internet and software for integrating operating systems and sharing information along the supply chains has been considered as a direct cost (Burges 2006). Indirect costs may be such as labour costs and opportunity costs that firms may not obviously perceive as expenses (McLren 2002).

### **2.3 Knowledge and information sharing**

As previously described, supply chain consists of many participants. Companies must purchase and send out goods or services. Being part of supply chain means companies are forced to exchange information, starting from order information all the way to delivery information to customer. Also, information between the departments inside the company needs to move back and forth. Usually company is part of many different supply chains and it must decide which kind of information and knowledge is necessary or useful to share with suppliers and what information company desires from its customers in supply chain. Information can be just changing opinions in phone conversations or detailed information, for example, about product structures.

Lotfi (2003) writes that Surviving and competing in today's volatile global economy and uncertain environment leads organizations for a strong need to create, share and disseminate updated and appropriate information. And Fiala (2005) states that a supply chain stays connected by flows of information, finance and material by the suppliers, producers, retailers, distributors and customers. In the past information sharing was mainly linked to material flows. The necessary information of material deliveries or delays were exchanged. Today, companies focus more widely on information sharing and they have made plans and instructions to manage information exchange. For example, supplier can share information about internal quality measurements with predefined software. There are many incentives on flowless information sharing which might embrace fixed prices, delayed orders penalty and reducing the lead times. In fact, a lot of companies have provided a great focus to enhance the integration and collaborative efforts between different supply chain members to increase visibility across businesses (Tan 2016).

It is understandable that information sharing has increased in the past three decades because of rapidly increased digitalization. Almost every company has Enterprise Resource Planning software (ERP) in use. ERP software makes it possible to share information online to suppliers and shared information can be predefined. Also, software's

to protect information has been developed, like Nasereddin (2011) writes, some technologies have been developed to protect data such as the digital watermarking technology which is important for hiding data and digital copyrights protection. These software's have made it easier for companies to adopt supply chain management procedures and thru that supply chain management and information sharing is recognized to give companies advantages in the ever-tightening markets. This has led to situation where software solutions are managed through supply chain to give all business partners the ability to share integrated information across the distribution channels which lead to raise the supply chain efficiency and enhance the organizational performance in all sectors (Lu 2011).

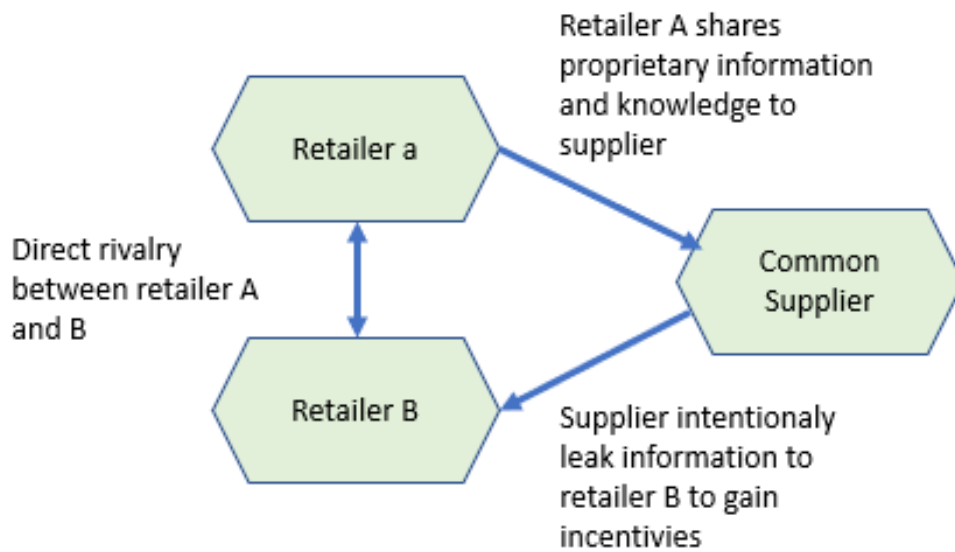
Furthermore, sharing information among supply chain brings chain members benefits by reducing different types of uncertainties related to for example demand, products and technology that add costs to supply chain processes. Also, supply chain becomes more efficiency and effective (Hassan 2018). More advantages are revealed by Khurana (2011) including better coordination between different departments and between supply chain members and improved control of the supply chain processes, also reduced product design time, shorter production lead-time and stable the outputs along with reliable quality. Khurana (2011) also writes that good structure of information sharing is the key component to any SCM system. Mourtzis (2011) described advantages to manufacturing network such as.

- Efficient inventory management through improved communication
- Cost reduction in orders management through efficient communication
- Increased productivity and profit through more efficient completion of orders
- Improved resource utilization through better management of the work allocation.

(Mourtzis 2011)

Although information sharing is recognized to be useful there are some supply chains not sharing much information. That is because of some limitation due to information systems compatibility, information quality, trust and confidentiality issues (Hassan 2018).

Like Hassan (2018) writes, trust and confidential issues can be ones to hinder information sharing in supply chain. As we know, it is difficult to build up trust, but even more difficult or perhaps impossible to win back once lost trust. Simatupang (2001) states that willingness to share information depends on trust and the economic value of the information. There is one major risk called information leakage. Companies can be afraid of confidential information leakage to unauthorized parties. Usually this means unintentionally leakage of information but sometimes leakage might be intentional. Either way, it is all about trust, do companies trust supplier capabilities to handle information or do individuals in company trust supplier's personnel to be reliable. In a competitive market, opponents are not shy to use all information they can collect about their competitors. Tan (2016) writes that information leakage is a serious risk due to real incentives, that is, companies have strong motivations and more than enough capabilities to collect, analyze, acquire, and utilize information from others to gain a competitive edge. Tan (2016) continues stating that there are basically two major factors of leakage which are either natural factor or human factor. Natural factors are factors that could not be controlled by any party in the supply chain such as Communications or human movement, whereas human factors include the leak of critical information to external parties because of unethical behavior or hidden intentions by human like in Figure 7 (Tan 2016):



**Figure 7:** Scenario illustrating information leakage in a supply chain (Adapted from Tan et al., 2016)

Tough, there are cons in information sharing it is better to cooperate with supply chain members because there are much more good sides. One more benefit that is not often mentioned is the fact that when collaborating and sharing information, the company gets to keep better 'eye' on supply chain members, meaning that company can see early warning signals if something is to go wrong with members in supply chain.

in the literature, when studies deal with information sharing, many times the knowledge sharing is included closely to the subject. In fact, many issues behave in the same way in both. In reality, when asked personnel in company, one can't always tell if the shared issue is information or knowledge or is the shared knowledge also information. Knowledge is considered to be exact data about product or service itself or manufacturing know-how and for that reason companies want employees to know which knowledge is critical and is not allowed to share. Polanyi (1983) classified knowledge in two categories which are explicit and tacit. Explicit knowledge can be put in the formulas, charts, numbers etc. So, it can be said to be real. For example, it can be put on paper in form of a drawing with calculations. Tacit knowledge can be subjective and indescribable, and it is based on experience (Polanyi 1983). Explicit knowledge is more palpable and easier to

share and express than tacit knowledge (Cress 2006). Like discussed earlier in paragraph, researchers believe that sharing tacit knowledge is also included in information sharing as well as explicit information is (Nonaka 2007).

There are studies (Rashed 2010) showing information sharing with supplier is promoting knowledge sharing. If there is a continuous flow of information like quality or future demand forecasting information, the buyer is probably interested to share information like future market trend and the new market directions with their supplier. On the other hand, knowledge sharing doesn't necessarily have strong effect on supplier relationship because in many cases smaller supplying company is not able to use knowledge-based information effectively. (Rashed 2010)

## **2.4 Summary of literature review**

In the literature review the focus was of course, in the quality. Different views of quality from the management to improving quality. Also, supply chain perspective was reviewed from the quality to information sharing. It should be noted that there is lot of research material on this topic and this literature review gives only a peek at what can be found on the subject. Important areas regarding this study were revealed.

At first Quality management were reviewed in general. There could be found many slightly different definitions of quality. This is of course due the long history of quality research and all the time increasing importance of the subject to companies. To mention a few definitions for example Juran (1980) defines quality as: Fitness of purpose or use and ISO 8402 (1986) standard as: The totality of features and characteristics of a product or service that bear its ability to satisfy stated or implied needs.

Perspectives of quality were introduced. Those are useful to companies when they are planning supply chain cooperation. Garvin (1988) reviewed perspectives as follows: transcendental-, user-, product-, producer- and value perspective. Depending on situation in company some of these perspectives are more important than another and company can focus on these areas for example by means of TQM. For implementing TQM there could be found different kinds of frameworks from the literature. For example, Baldrige Award Criteria gives 7 major criteria which helps companies to evaluate status of quality. Also, authors such as Deming, Juran and Crosby have their slightly different perspectives on TQM.

After implementing quality procedures like TQM work towards better quality is of course not over. Good quality needs continuous improvement and control. For that there is for example European Foundation for Quality Management (EFQM) model which is an instrument for TQM. To mention some other methodologies there are: Lean, Deming's system of profound knowledge, The Improvement Model Framework Continuous Process Improvement, Six Sigma and the PDCA cycle. These ones are widely known, and it is easy to find information and guidance to implementation if necessary. Demand for implementing quality instruments has generated whole new business area of providing quality implementation by the consultants.

It is not enough to manage quality internally in company. Also, the quality in the supplying firms needs managing as well as in supply chain in general. Like Waller (2004) states Manufacturing and service companies cannot be considered as independent actors on the market anymore, because their production output is greatly dependent on their supplier's performances. Benaisa (2010) states that supply chain quality management is official coordination, integration of business processes, of all organizations that are members of a supply network.

SCQM gives guidelines to manage individual supplier quality in supply chain. Maundu (2016) states that firms need to monitor performance of their suppliers to ensure that



they conform to the set of the buyer. And according to Kochhar and Saeed (2012), purchasing managers have a responsibility of monitoring supplier performance. Six different SQM practises were revealed. These practises help companies to monitor and compare supplier performances.

And collaborating in supply chain can be split, for example, in three dimensions like Simatupang (2004) does as: Information sharing, Decision synchronisation and Incentive alignment. As there are clear benefits like increased quality there are also internal and external costs like software licenses. So, companies need to weight pros and cons when collaborating.

One major aspect of cooperation is of course information and knowledge sharing. Lotfi (2003) writes that Surviving and competing in today's volatile global economy and uncertain environment leads organizations for a strong need to create, share and disseminate updated and appropriate information. Nowadays, ERP software makes it possible to share information online to suppliers and shared information can be predefined. Khurana (2011) also writes that good structure of information sharing is the key component to any SCM system. Mourtzis (2011) described advantages to manufacturing network, one being for example, efficient inventory management through improved communication. Although information sharing is recognized to be useful there are some supply chains not sharing much information. That is because of some limitation due to information systems compatibility, information quality, trust and confidentiality issues (Hassan 2018).

### 3 Research methods

Brainstorming of this thesis started in Autumn 2019. Author of this work started scanning possible topics to research. Quality was under interest because author has previous experience and interest on that area. With the good contacts on organizations quality department the persons to co-operate were found. One of the first things to decide after choosing the topic of the research is the research methods.

Like Creswell (2003) writes in his study there are three research methods to focus on: Qualitative, quantitative and mixed approach. Shortly, quantitative method is thought to deal mainly with numbers. It can be used to quantify behaviours or attitudes and to analyse data from a larger sample group or to find patterns in research with measurable data (DeFranco 2011).

In contrast, simplified, qualitative method is collecting information and data which is not numerical. DeFranco (2011) writes that qualitative method is used to provide hypothesis and ideas to prospective quantitative research by giving insights to research problems.

Mixed research includes components of both qualitative and quantitative method. This method is reasonable young though researchers have always mixed these methods up a little bit. But today, it is more acceptable to admit that maybe it can be recognised as a method.

After analysing the subject and possibilities of this study from the case company point of view, this study was decided to be conducted as a qualitative case study by using semi structured interviews. In this case, more specific and 'under the surface' information was wished to be received. And research was planned to be carried out to small group of nearby suppliers by semi structured interviews. Also, company does a lot reporting based on daily data. This have already given perspective on how things look from data point of view. Of course, it is recommended to compare data to findings from the interviews.

### 3.1 Case study

Like told in previous chapter, this study is carried out as case study. Saunders (2009) defines case study approach as a research strategy which empirically investigates some real-life phenomenon using multiple sources of evidence.

Main goal of case study is to analyse, define and create a resolution for case study subjects. In case study method one or multiple cases can be examined, and it is never obvious how the examined subjects are limited, selected and justified. Studied phenomenon can be for example event, individual or group. Both, qualitative and quantitative data can be used in case studies and, data can be analysed by many different methods. (Eriksson, 2014: 4-5.)

There are some listings on literature how case study can be used. One of them is Eriksson and Koistinens (2014:5) listing:

- What, how and why questions are central.
- The researcher has marginally control of events.
- Not much empirical research has been done on the subject.
- Research object is phenomenon from current life. (Eriksson & Koistinens 2014: 5.)

Case study method has usually contextual approach. This means that the specific case investigated at time is part of the specific environment. Research subject can be defined in various ways in the context of research environment. Context can be formed for example from cultural environment or industry situation where the subject is observed. (Eriksson, 2014 :7.)

The nature of the research design and the purpose of the study defines the possible ways to conduct case study research. In general, case studies can be divided in the

intensive or extensive research trends. Case study research can be intensive or extensive. The goal of the intensive case study research is understanding the case from the inside by providing holistic and contextualized description and interpretation. Whereas, extensive case study research tries to generate theory through the comparison of multiple cases in order to obtain generalization. (Eriksson, 2016: 133)

In this study the focus is on quality cooperation between case company and nearby suppliers. This phenomenon is investigated from the suppliers' point of view and target is to find answers rising from the case company side as well as to find not yet recognised issues to do better. Qualitative case study is deduced to be most effective on this case because information in people's minds is planned to be revealed in a more transparent form. Like Saunders (2009) writes, case study approach has ability to answer questions why, what and how. That is critical for this study because also peoples 'feelings' on quality issues are under investigation. The main purpose of the study is to examine information obtained from semi structured interviews. In this kind of interviews, it is not practical to use quantitative method because it can't reveal the real nature of possible problems. In this case study, the initial setup for qualitative research was optimal because of the familiarity between the interviewer and respondents. interviewees were relaxed and didn't feel pressure to give answers which they thought might be the acceptable ones.

### **3.2 Qualitative method**

As explained in earlier paragraph, the qualitative method was chosen as the research method of this study. Data from the case company's suppliers were collected by interviewing small number of employees. Questions could be answered openly, so it was expected that there would not be much numerical data to analyse. So, this thing favours qualitative method.

The simplest memory rule people use to distinguish qualitative and quantitative method is to remember that quantitative method is about analysing numerical data and

qualitative method vice versa analysing not numerical data. Like DeFranco (2011) writes, qualitative method is making observations through non-numerical data, and continues, that this approach could be used to help develop hypothesis to potential quantitative research and to gain insight to problem by giving an understanding of underlying motivations, opinions and reasons.

Data can be collected for example by interviews or case studies. Even group discussions can be used to gather data by participating and making observations. When compared to quantitative method, the qualitative method covers subject in depth and in details. Data is considered to be more powerful because it is based on human experience. (Sharma, 2018.)

In his book, Olkkonen (1994) states that one perspective to data collection in qualitative research is hermeneutic, meaning that understanding between researched phenomenon and researcher is central and must be interpreted. There could be areas in research which are hard to measure by statistical methods and needs more understanding. Those areas can be for example observed phenomenon, factual concepts or processes in researched area. (Olkkonen, 1994.)

The familiarity of research subject is considered to be advantage for the researcher especially in qualitative research done with interviews. Familiarity starts from small things like professional terminology all the way to large scale trends in professional area. This is one of the reasons for choosing qualitative method to conduct this study. Researcher with professional knowledge must remember to explain things in a way that readers understand it.

### **3.3 Research companies**

In the centre of this study is case company which cooperation between its suppliers is researched. The case company and suppliers will remain nameless. The case company

will be named as company X and suppliers are serially numbered from 1 to 4. Even though the most sensitive business secrets are not revealed, the company wished to remain unnamed as well as suppliers. Also, anonymity is considered as advantage because in that way the readers of thesis would not have anticipations due to company reputation. Main reason for chosen company X as case company were the fact that author of this thesis is working at the quality department of the company. Some areas to improve have raised up during the years of working in quality department and the opportunity to do thesis for the company gave chance to research one of these areas.

The case company of the research is part of the multinational technology group. The group has business units all over the world and it employs many thousands of people. Also, because of global presence the network of suppliers covers all the continents. The case company is in town of Vaasa, Finland and it employs hundreds of people. It manufactures technology equipment's to B to B market. Company purchases components from the network of suppliers from all over the world, mainly from Finland, Europe and Asia. Purchased components varies from the hi-tech electrical devices to heavy cast iron components. Some of the company suppliers have been in cooperation for many years and some are new ones. There is natural variation among suppliers as cooperation with same old ones comes to an end and new ones starts cooperation. The company is always looking for new suppliers and the worldwide purchasing and quality personnel is helping on that. In Finland, company is managing suppliers with local personnel. The company has many suppliers in the surrounding areas, from which many have been cooperating with the company for years. These reliable and familiar suppliers are the ones targeted in this study.

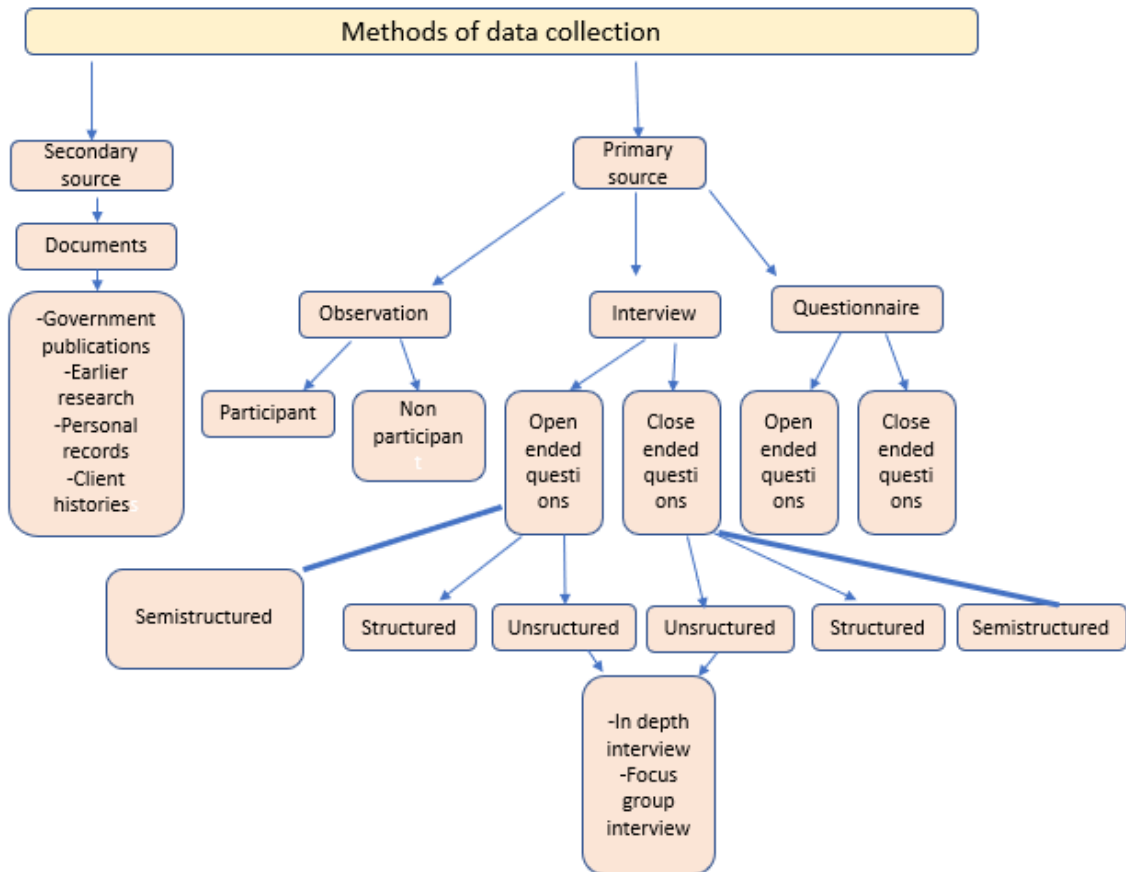
This study focuses on quality cooperation between the case company and four nearby suppliers. These subcontracting companies are located less than hundred kilometres away. One of the criteria's how the studied suppliers are chosen to this research is the products they are manufacturing to the case company. The subcontractors which this study concerns are manufacturing products without electronical components. The

products are machined cast iron, aluminium, steel or sheet metal parts. By limiting studied companies this way the results are more comparable. Furthermore, though suppliers are manufacturing different products the nature of their production is similar to each other as well as the size of the companies. The turnover of the suppliers varies from the 1.3 million to 9.3 million and the number of personnel varies from 15 to 52.

### **3.4 Used interviews**

One of the first things to do after the topic and research questions of the study are decided is to deliberate the best way to collect data for the research purposes. Of course, the literature review gives information on basic phenomenon's behind the subject of research. And case studies found from the literature helps to identify possible trends and patterns in similar situations as in case under research. Also, by studying the literature, the framework for the possible case interviews is easier to build.

So, interviews are one way to collect information and data. In general, Data collection can be divided in to primary and secondary approaches based on source of information. Information from the secondary sources is already processed information from previously published documents like for example, earlier researches, client histories or government publications. In turn, information from primary sources comes through observations, interviews and questionnaires. Observations can be in form of notes from the research group. Interviews and questionnaires can be conducted with open ended or close ended questions and furthermore, they can be semi structure, structured or unstructured. Unstructured interviews can be in depth interviews or focus group interviews. (Kumar, 2011). Data collection methods are clarified in Figure 8 below.



**Figure 8.** Data collection methods. (Adapted from Kumar 2011)

When preparing the interview, question in what form the answer is desired, is important. To simplify, close-ended questions are formed in a way which can be answered by simple yes or no whereas open-ended questions requires more thinking and more than simple one-word answer.

If the interview is carried out as structured, it means the researcher has created questions in advance and they are always asked in same order so that the responses can be categorized. Structured interview is quantitative and is usually used in statistical investigations. (Hirsjärvi, et al. 2007)

In an unstructured interview researcher doesn't rely on standardized questions but gathers information in a line with the purpose of the interview. Unstructured interview has a free-flowing nature and it somehow reminds everyday conversations. The researcher



can develop new questions based on respondents' answers and that way get more accurate information on research subject. (Hirsjärvi, et al. 2007)

Semi-structured interview is, as assumed, mix of both structured and unstructured interviews. Interviewer can prepare questions beforehand to guide conversation and to help staying in topic of interview. It allows respondents to open sensitive issues as well as gives opportunity to two-way conversation. On the other hand, it can also provide qualitative data to compare respondents and previous data. Interview can be conducted in writing, by recording or by filming the conversation. The writing format is closest to structured interview because usually respondents are not willing or doesn't remember all the relevant issues and interviewer can't make deepening questions. In recording or filming interview, the atmosphere can be more relaxed and deepening questions are possible. The interviewee can be encouraged to tell things in more detail. (Barriball and While, 1994, 328-355)

## **4 Analysis and results**

This chapter presents case interviews in general as well as interviews to suppliers and case company in more detailed. Also, analysis of relevant document and findings from interviews are included. Last paragraph summarizes interviews.

### **4.1 Case interviews in general**

After comparison of different ways of carrying out interviews, the semi structured open ended interviews were chosen to be ones for both, the suppliers and case company representants. Because of already existing basic data, the interviewer guidance to get more deeper information from interviewees was considered to be most important. For that reason, face to face interviews was the best option for this case study. In addition to guidance in interview situation, also the possibility to create friendly and relaxed atmosphere was important on getting interviewees to open more deeply. The interviewer was familiar to representants from both the supplier organizations and case company organizations. Some interviewed persons were familiar through earlier phone meetings and some from live meetings. So, there were no new acquaintances in the interviews which helped on getting interviews going smoothly without tensions and there was no need for introduction on personal level. The trust between interviewee and interviewed already existed which was great starting point for the interviews.

The interviewer was the author of this thesis and interviewees varied from the top management to order processing worker in the supplier organizations and in the case company departments. Despite the position of the interviewees all the persons interviewed was chosen based on their involvement to cooperation between case company and supplier. All the interviewees had previous experience on quality issues between companies of the study. All persons requested to be interviewed were willing to participate in both, case company and supplier companies. One could argue that willingness on participating to interviews is because of customer seller power relationship but the motive seemed

to be a genuine desire to improve things. And of course, among the case company interviewees the motive was improving quality with the awareness of quality cooperation pitfalls.

Like mentioned earlier in this study interviews were carried out face to face with participants. Naturally, interviews with case company representants were held on company's premises and interviews to suppliers were held on supplier premises. It seemed that conducting the interviews in the supplier premises made atmosphere favorable to semi structured implementation. Also, all the suppliers wanted to introduce their production facilities and at the same time demonstrate quality related issues. This made the interview visits really rewarding for both parties and gave good starting position to interviews.

Based on starting situation mentioned earlier, the interviews were conducted as semi structured. The basis for the questions was firstly the knowledge and hints of quality related issues within the cooperation and secondly preparatory discussions with mentors in case company quality department as well as the literature review. The questions in the interviews was open ended. They were designed in a way which required guidance from the interviewer. The focus was in keeping discussion in each question's topic. The interviews were recorded with the basic smart phone recorder and afterwards transcribed to interview form. In this way things from the wide answers could be placed under the correct questions in case of straggle. The questions were divided in to five quality related areas and these areas contained from four to seven open ended questions. One of the question areas focused directly to quality status from the view of case company of this study and of course that area was not included in supplier interviews. Finally, all the answers were placed into the table for the better comparison. Because of very wide and nuanced answers they were simplified into the table.

## 4.2 Interviews to suppliers and case company

The interviews were the most important part of this research. There for the drafting of questions were put a lot of effort. In addition to literature review also the experience of author and supervisor was base to interview questions. The order of the interviews was important because the answers of case company interviews was used to modify supplier questions on more specific by focusing quality areas which raised up from the answers. So, the interviews for the case company representants were conducted first. The duration of interviews was planned to be approximately one hour. Compared to research area and amount of questions one hour seemed too short but it turned out to be correct. When answers started to extend too wide the guidance of interviewer helped to stay on schedule. As discussed in previous paragraph, the questions were divided in to five quality related areas of which one concentrated overall quality status of all suppliers in this study and was only asked from case company representants.

Two people were interviewed from the case company. Both interviewees were in managerial position and have long working history in case company. And, eight people from the supplier companies were interviewed. Three of them were company managing directors and had at least partial ownership of the company. Two of them held managerial position and last three interviewees were in operational position concerning quality related operations. In terms of this research the position of interviewee has no influence. All the answers of participants are equal and there for there is no need to specify the position and answers of each interviewee.

Interview questions were divided in four to five quality related areas with four to seven open ended questions.(appendix 1) The questions were introductory and there for answers were expected to be somewhat overlapping and for that reason there is separate form in which answers are collected and written clean. Also, the questions were in slightly different way formed to supplier and case company representants. The five quality related question areas with short description are as follows:

- *Quality status in general:* Quality situation globally and in Finland as well as quality situation with components. More detailed quality situation with different parties and the prevailing trend of quality improvement.
- *Supplier quality:* Quality, availability and accessibility of the data. Current status of reclamations and traceability of components. Variability of the software's with different parties. Immaterial quality as a whole.
- *Quality cooperation:* Quality communication, hierarchy and influencing in cooperation. Knowledge of the partner organization and awareness of own organization goals. Software's and meetings used in cooperation.
- *Possible quality improvement subjects:* Which areas of quality requires most time and which areas has most improvement potential. Improvement potential between different parties. Which could be the three most important things to improve and which areas are in such good form that one could learn from it.

In addition, representants of case company were asked about quality situation in target suppliers of this research. This question area can be shortly described as follows:

- *Quality status with target suppliers:* Is there some quality area rising from the mass and which kind of instruments are there to measure quality. Which is the influence and adoption of audits. Awareness of shared data, documents and software's. Situation with supplier subcontractors and logistics.

In general, adoption of interview questions was positive, and interviewees didn't feel there was something important left to discuss. There was some overlapping noticed with answers to different questions, but it didn't harm because all participants were aware of transcription of interviews. In fact, it gave deeper understanding of linkage between different quality areas to each other.

#### **4.2.1 Analysis of the documents**

The content of the interview questions was introduced in the previous chapter as well as the number of interviewees and their position in their organizations. The interview execution method and interviewee behavior in the interview situation have its own role in analyzing the answers. This section discusses the analysis of the responses to the interviews in more detail.

After the interview recordings were transcript, all individual interviewed person answers were put in the same Excel table, with the difference that company and supplier answers had their own Excel tables. These excels are not included as resource with this paper because of the large size but there is comparison excel with same idea (Appendix 2). All different question areas with subtitles has own row in the Excel. So, for example for the supplier answers there are four rows, and eight columns for each different interviewee. Last column is for summary of all answers for that particular question area. For each question area the subtitle topics were separated from each other by colors. In this way, answers to each subtitle area could be easily analyzed individually, the most occurring issues could be raised up and less occurring issues could be left with less attention.

The interviews were conducted in Finnish. Also, the transcripts of the interviews were written in Finnish. Only the summary of interviews was also done in English. For this kind of semi structured interviews Finnish is suitable language because Finnish wording is very multiform. The emotions can be described easily at its smallest only with the endings of the words. So, in transcription of the answers the frustration or enthusiasm could be written down easily in Finnish. The tone of the voice of interviewees was tried to include in the transcript.

As previously stated in this study the emphasis is heavily on finding issues to improve in cooperation between small group of nearby suppliers and case company. For that reason, the researcher consideration in analyzing of answers has significant role. This meaning in analyzing of answers some detailed answers could have more attention than in larger

scale studies based on general improving of quality. Of course, this does not rule out the importance of comparison between findings and literature.

For this research there were two different groups of interviewees, supplier and case company groups. Comparison between these groups is important to find out possible gaps in opinion. Also, the researcher must keep in mind neutrality when analyzing answers. Interviews and summaries of interviews for both groups are in same form to make comparison easy.

Like mentioned in previous chapter, in practice the analyzing is made by using Excel tables and by separating different quality areas with colors in each main question area. To clarify see the example row from summary excel under. Figure 9

Section	summary of interviews
Quality status in general -Supplier qaity status. -Trend in different components. -Quality resource situation	-Supplier quality situation is better than some years ago. Learned to develop new suppliers effectively. -There are no clear differences in deliveries due to the source country. -Product transfers have come with suppliers with different operating methods. -Sometimes the line between own quality and supplier quality is blurred. -Also, in the component level, quality have improved throughout suppliers. -In some components, it feels like some quality cases lead to own actions. Readiness of new designs could be better. -In own company the quality resource situation has somewhat improved, but focus could be more on supplier in quality. Supplier quality responsibility should be extended wider in own organization. -In higher organizational level the developement is not what it could be. Use of a global quality organization is tricky.

**Figure 9.** Example section of summary excel.

This way, with help of colors all the answers were analyzed from the first interview true the large Excels to final summary.

### 4.3 System data of quality errors

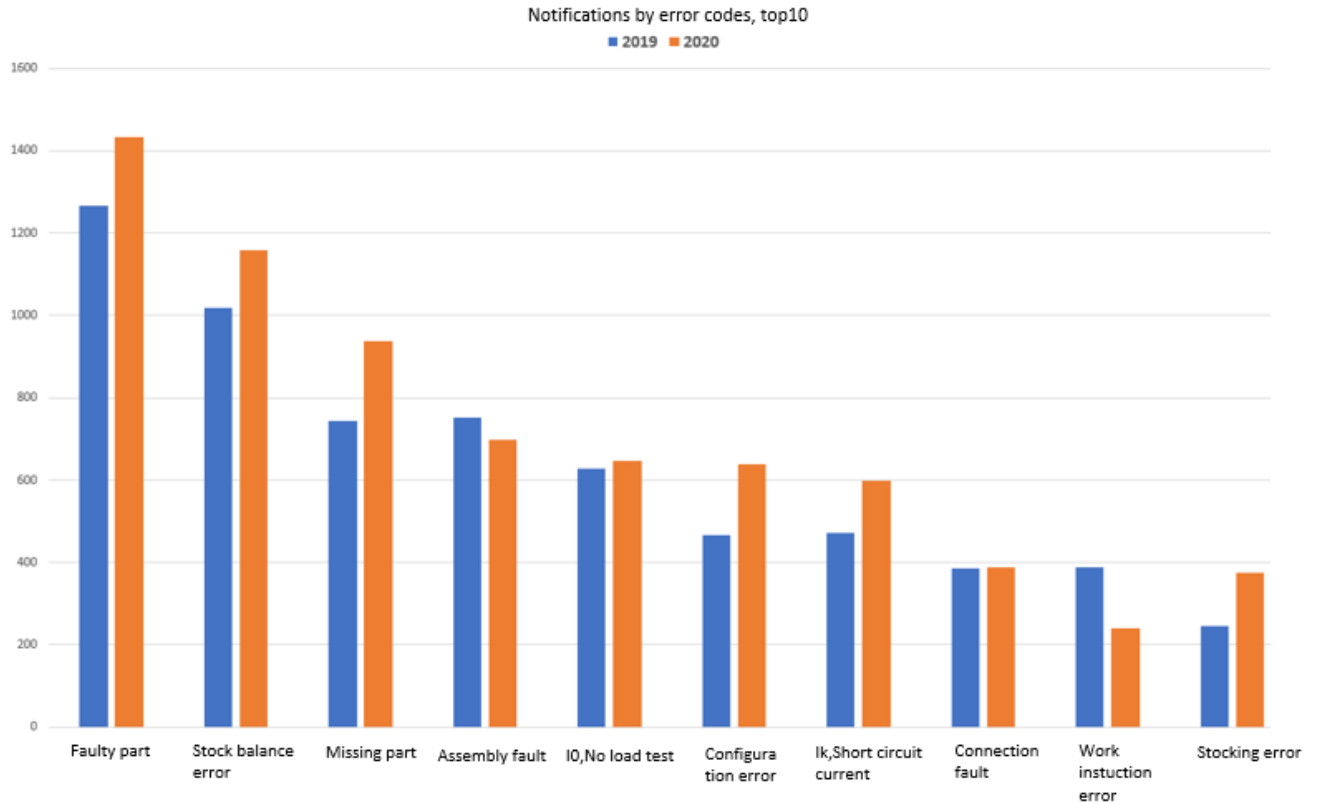
The case company has a comprehensive Enterprise resource planning (ERP) system in use. This software provides inclusive possibilities to monitor quality trends under the operations of company. For example, quality defects can be examined separately by each production line or by each supplier. There is possibility to pretty accurate define one single quality defect with ready-made options provided by ERP. Usually, in reality the quality errors are such complex that they are explained in free text field in ERP and there for can't be traced by codes. Usually the personnel don't have time or knowledge to determine the origin of the error.

However, in general case company monitor quality errors systematically and is able to act on changes in quality trends quickly. The main quality defects by codes from years 2019 and 2020 are presented in Figure 10. It can be seen that largest number of errors during production are under faulty part code. It has to be noted that faulty part can be caused by supplier but also by case company. Also, all four largest defect codes could include errors caused by both parties. For example, root cause for assembly fault can be minor defect caused by supplier.

Also, yearly data is in line with answers reflected from questionnaire done to suppliers. For example, confusing drawing changes can show in faulty part code or unclear communication in stock balance error and missing part code. Figure 10

There are two headings blurred for the privacy reasons. Figure 10





**Figure 10.** Notifications by error codes, top10. (Case company records 24.2.2021)

#### 4.4 Findings from interviews

Like mentioned earlier, interviews are implemented as semi structured, which is characteristic to qualitative research. For that reason, the findings are also presented in written form with no numeral data. Also, the scope of interviewees is only eight participants from supplier and two from case company side with in four supplier companies. So, the goal is to delve deeper behind the answers of this group of interviewees. Findings are presented in order by same question areas as in the interviews and keeping in mind the research questions.

#### 4.4.1 Quality status in general

The first question area was *quality status in general* globally and in Finland. Also, situation with different components and quality resources was under interest.

- Opinion of both parties, suppliers and case company, were that over all status of quality has slightly improved. Case company side thought one reason is the fact that company have learned to develop new suppliers effectively. Also, both parties agreed that there is no significant difference in from what country delivered goods are, Finland was not mentioned in terms of better quality. And all this was same in component level.
- Supplier side mentioned that in general communication has gone slightly more in unfriendly direction. And there are mild signs that the lack of clarity of communication is causing some quality issues. Case company side feels this issue can be seen even between case company departments. This, plus the increased requirement for documentation can cause misunderstandings which can be seen in quality of final products. And the line between supplier and case company quality can be blurred for the lack of clear communication.
- Both sides are somewhat satisfied in quality resource situation. More personnel have been hired for few suppliers, also in case company. It is more a question of where the available resources are directed. Especially, case company side feels supplier quality responsibility should be extended wider in own organization. And the use of a global quality organization is tricky because of complex products.

#### 4.4.2 Supplier quality

The second question area was supplier quality consisting for example, quality in researched suppliers which includes the origin of quality challenges and cooperation. Also, immaterial quality is included meaning for example data accessibility and audits.

- There was one excellent answer from supplier side which capsulized the opinion of all representants about the origins of quality problems in order, carefulness, communication and instructions. Both parties feel negligence problems should be reduced but also admits that it is difficult when people are involved. Negligence problems can be seen for example in packages of deliveries. Amount of delivered goods is not correct or components are damaged due the sloppy packaging. Still, both parties recognize the obscurity caused by operational differences between case company units from systems to packaging.
- The difficulties in drawing and instruction revision changes came out in almost every representant's answers. Web software for loading drawings works perfectly but the revision changes causes difficulties especially if the changes are lower in drawing chain. Also, suppliers feel there are some unclerness in instruction changes and in this context case company side have doubts about how case company is able to communicate correctly and reliable not only the instruction changes but also requirements of non-physical product like material certificates. Both parties would like some kind of alert system for drawing revision changes.
- In the opinion of both parties the audits are useful, and improvements have been made based on them. Newer the less, case company side have some doubts about how required changes are implemented and feels findings from audits should be monitored more actively.
- The saving of documents and measurement reports and material markings seems to be clear to suppliers but there are different ways of providing them to case company. Case company doesn't see any problems in accuracy of documents, but this is poorly controlled. Also, inside case company some difficulties have been met in communication, for example, of the location of documents.
- Suppliers experiences reclamations as constructive and preventive. Information goes all the way to roots of problems. Case company recognises problem in comparison of number of reclamations between suppliers because of significant difference of amount inspections carried out to different suppliers.

- There are some questions on whether the performance and other metrics from supplier and case company are compared to each other. Some communication in this area would be welcome as well as in component inspection which are made in both sides. The double inspections should be reduced at least in some extent.
- The use of Share point for sending documents varies between suppliers and e-mail is still partly used for this. There have been some problems with ASCC order tool, but case company have provided help in these situations. There is a feeling in case company side that the readability of the instructions from IMS is not as good as it should be and are company own people aware of how the documents should go to the supplier.
- After sales cooperation was hardly identified, but opportunities for cooperation were seen. Problems are often difficult to target.

#### **4.4.3 Quality cooperation**

The third question area was quality cooperation which includes for example, quality communication, hierarchy and influencing in cooperation as well as knowledge of the partner organization and software's. Also, meetings used in cooperation was under interest.

- In daily communication phone, email and Whatsup are in use but the missing documentation of the calls is sometimes perceived as a bit problematic. Purchasing seasonal meeting includes quality section and suppliers feel it is enough but case company side feels it might be good to have a quality person involved, it would allow a better collaboration. Also, both parties emphasize good personal relations which are formed in history of mutual cooperation.
- Suppliers have feeling that they are in the same boat, daring to bring forward development proposals and difficult issues. One good metaphor that describes the attitude of these nearby suppliers came up in interviews and is worth

highlighting here "*If there is a stone in the shoe it has to be taken away, otherwise you have to limp for the rest of your life*".

Suppliers feel most development cooperation is with case company design department and that the cooperation is fast in quality matters. In addition to this, in many issues case company have noticed the habit of taken the first contact to case company purchasing department which is not necessarily bad but could sometimes left important things confirmed for example from design department. On the other hand, at the general level, more cooperation is desired.

- Suppliers have most of the communication with case company purchasing department and contacts are mainly found from earlier communication. Personal changes in all organizations are usually communicated to others by email, but it is not an established practice. Case company side feels those in different positions have their own contact networks and even in own company, sometimes contacts are bit missing. Some suppliers have shared email in use for reclamations which ensures someone reads the email. Also, it is mentioned that the communication with Estonian purchase is more difficult than with in Finland especially in case of ambiguities. Both parties think some kind of up-to-date list for contacts would be welcome, maybe some tool for this.

#### **4.4.4 Possible quality development subjects**

The fourth question area was possible quality improvement subjects consisting for example, areas which has most improvement potential and areas which requires most time at the moment. Also, top three most important areas were scanned as well as issues which are in such good shape one could learn from it.

- Supplier side feels cooperation could be improved by clarifying communication. There are differences between customer departments and locations and sometimes oversized bureaucracy complicates and delays things. On the other hand, case company side feels quality culture must be developed in the direction of the

supplier. There must be information sharing on engine applications and the impact of errors to the end user. Also, security and economy perspective must be included.

- In supplier opinion, case company supplied component quality should be more consistent, also from the packaging point of view and the control of customer-specified sub-suppliers should be clear, Who, how and according to whose instructions are used in control. While, case company side thinks the quality department should be able to practice more development in supplier quality matters. Also, in cooperation with procurement.
- Suppliers hopes better access to the instruction database and faster information about changes. In terms of efficiency and savings, more cooperation is hoped. Additionally, case company quality department proactive actions have been found to be good, but even more emphasis would be welcome.
- The small size of storage buffers raises questions at supplier side, there is not much room for waste. And, related to storage and shipping, case company side feels component packing responsibilities should be clearer. Also, there should be quality assurance plans for the supplier for each component and better documenting which components are traceable, and which are not.
- In supplier opinion, revision changes to drawings needs to be clearer and alarm to revision changes would be good.
- Overall, everyone should be more aware of what is required of the supplier. And there is feeling time goes to put out "fires" and investing on improving operating culture and processes does not exist.
- Top things to improve from the supplier's point of view are for example, wish for meetings with quality people once a year, the reducing of human and carefulness errors and making SharePoint using more efficient as well as MSP tool more stable.
- Case company sees top things to be improved for example, the need of harmonising of requirements between case company units as orders of some critical components can come from 4 different countries in the future, the need for

company to invest more in supplier cooperation to allow quality expertise to support other departments and making of reclamations should be sharpened in production.

- As a good and positive thing mentioned are for example, the good overall level of cooperation thanks to good personal relationships, the nice working drawing retrieval practice, the achieved good balance of component deliveries from the case company to suppliers and the good proactive actions of case company purchase and quality personnel to make improvements happen before errors.

This section focused on presenting most important findings from interviews. The results have been condensed by highlighting the issues that came up the most, but also giving voice to individual issues that are important links between different question areas. Also, the results are presented keeping in mind the case company requisition for research. Meaning, the results are not adapted to follow classic literature but to give specific information to case company. Anyhow, Comparison to literature is done in section 5.2 and findings are reviewed further in recommendation 5.3 and conclusion 6 chapters.

#### **4.5 Summary of interviews**

This paragraph focused on presenting case interviews in general and in more detailed concerning supplier and case company interviews. Interview question areas were introduced with short explanations. Interview questions was prepared in Finnish and are presented in appendix 1. For privacy reasons the responses of the individual interviewee are only in the possession of the researcher. Summary of interviews in Appendix 2.

Interview situations went as planned beforehand with no unexpected surprises. All participants were in good mood and willing to give their contribution to research. Though, the form of interview questions were semi structured, there could be found similarities among the answers of interviewees. Also, was noticed that despite of seller buyer

relation there were similarities between case company and supplier answers. So, one can note that same kind of thoughts of areas to improve in cooperation are in minds of representants from both sides. As expected, the answers of case company representants were much longer and included lots of information. They have a great knowledge of quality and supplier interface and the most suitable information to this research could be captured to weight opinions with suppliers.

Like revealed earlier in paragraph 4.2 there was two different excels to analyze and summarize case company and supplier answers. Furthermore, there is Excel for compare supplier and case company answer summaries to each other (Appendix 2). This kind of comparison is important because the thoughts that have emerged in both interviews are likely to be the ones that are important to take forward. And when these thoughts have the recognition of both parties, they are likely to be easier to develop forward with less resistance to change. A short section of the supplier and case company answer comparing excel is introduced later in this paragraph. (Figure 11) In this Excel same kind of color coding for separating different quality areas from each question section are used as in case company and supplier answer analysis. The logic is that the second column contains suppliers 'idea of some particular quality area and the third column contains the company's equivalent to same area in the same color.

1	section	Summary of interviews: Suppliers	Summary of interviews: case
	Quality status in general -Supplier quaiy status.	-Quality'v stayd apr. at the same level for years now. Opinions to both directions. -Finland or any other country have not been mentioned for the better quality. Other countries provides also good quality	-Supplier quality situation is better than some years ago. Learned to develop new suppliers effectively. -There are no clear differences in deliveries due to the source country.

**Figure 11.** Supplier/case company answer comparison.



So, this can also be seen as discussion between these two parties. At first supplier side gives their opinion and after that case company representants gives their answer with own opinions.

## **5 Discussion**

This chapter presents most interesting findings and trends raised up from interviews and comparison of these findings to literature as well as recommendations for the future actions and suggestions for further research. The interviews with questions and answers were presented in previous chapters and the summary of results can be seen in appendix 2. Due the large scope of material the entire results of the interviews cannot be presented in the actual text of the research.

### **5.1 Comparison to literature**

Earlier in chapter 2, literature related to the subject of this study was discussed. The knowledge of general theories of quality is important in such case studies. However, one must keep in mind the initial setup of this research considering for example the amount of studied companies. There are a lot of studies on implementing quality concepts to various kinds of companies in different situations. But in this case the studied company has quality systems in everyday use. So, the interest is not in implementing new quality concepts but at the cooperation in interface of case company and its suppliers. Suppliers could have different tools to manage quality than customer company. Furthermore, the framework is not necessarily harder when already existing concept is improved from two different perspectives but different than in case of implementing completely new concept.

So, in this context the focus is more in supply chain quality management rather than in quality management. Of course, quality management aspects like TQM must be considered for each company. Like Cormigan et al. 2007) writes, manufacturing organisations should focus attention on their suppliers' performances to be able to protect their final customers' needs.

In his study, S.J. Gandhi (2018 7-33) researched manufacturing unit's service quality role towards suppliers and found results to be largely in line with many other researchers like Panasuram et al. (1985), Akan (1995) and Kumar et al. (1995). S.J. Gandhi's study developed valid measurement scale depicting the manufacturing unit's working towards their suppliers and to assess the quality at various steps in supply chain. The study demonstrated four factors to measure quality towards suppliers which are Assurance, communication, alignment and responsiveness. These areas, with their different emphases, are reasonably similar to the findings of this study.

S.J. Gandhi (2018 7-33) found order of importance to these areas as follows: communication, assurance, responsiveness and alignment. Also, in this study the communication pops up in many ways from the answers of the interviews.

Communication is defined with four factors by S.J. Gandhi (2018 7-33) as follows: Honesty in providing information, sharing information related to Inventory, giving prompt feedback about quality of products and Informing changes in manufacturing schedule. In this context, the assurance, which is defined as the ability to win faith and trust of supplier is affiliated to communication in a way that reliable communication is base to assurance factors like long term collaborative relationship and use of right tools and equipment. Also, in this study the communication is found to be one of most effective factors in cooperation. In the overview of research answers the issues like willingness to meet case company quality personnel at least once a year, need for up to date contact listings and harmonizing communication with case company locations and departments. Furthermore, the importance of sharing information about end user applications and the impact of errors to the end user come up as well as better access to the instruction data base and faster information about changes.

Two somewhat less significant factors in S.J. Gandhi (2018 7-33) research were responsiveness and alignment. Also, similarities between these factors and this research were noticeable. In his study S.J. Gandhi (2018 7-33) defines responsiveness for example as

Willingness to share supplier problems, respectful and positive attitude and prompt solutions to supplier's queries and alignment as flexible approach in dealings with suppliers and sharing company's future plans with suppliers. Responsiveness factor was clearly present in the findings of this research. For example, the issues like good personal relationships, proactive actions in quality matters and positiveness of audits were brought up. While, issues in line with alignment were such as improved development of new suppliers and recognized need to invest in quality resources and top management involvement.

Of course, there are other great studies of this topic like the ones of Schvaneveldt et al. (1991) and Johnston (1995) but S.J. Gandhi (2018) have used all authors mentioned in this chapter as a source and there for is suitable to comparison. Also, in addition to issues mentioned in this chapter many other issues mentioned in chapter 5.1 are in line with the literature of Gandhi (2018) and sources used in his study.

## **5.2 Recommendations**

In the Findings paragraph the answers of the interviews were summarized. From these answers the overall picture of current quality cooperation situation can be formed. There is not one big thing that would determine the situation but there are many little things that form a vision of how to improve cooperation. In this chapter three recommendation are given to improve cooperation though there are many others to focus on in the future.

In this context, the research concerning small group of familiar nearby suppliers, the most significant founding seems to be wrapped around the trust. Though many opinions and answers are dealing with some specific issue to improve or to praise, like the good personal relationships and honest communication, behind all this can be seen conscious and unconscious desire to cherish and improve trust between the parties. Supplier side has a desire to be in the same boat and case company side recognises the same idea.

One concrete thing to improve was to reduce human error. Of course, human errors can be reduced for example by using many kinds of inspection reports and checklists and systematic training of employees. But for suppliers in this research inspection reports are more or less already in use. It has been found that when there are too many checklists, they start to lose their purpose and filling in the lists becomes automation. It has been noticed that human errors come in waves, when people have been taught or reminded of mistakes, they tend to remember it for a while but because the humanity they forgot and then it is time to remind again. Both, suppliers and case company brought up the idea of quality personnel to meet in person for example once a year. More specifically, they believed if the case company's end customer device applications with all critical components were introduced in person the importance of individual work would strengthen and personnel would be more committed to quality. Also, these get-togethers would make people more familiar to each other and in that way make communication and cooperation easier. Furthermore, it would make suppliers feel they will be heard, and that they are important part of production chain. That way suppliers would be more committed to quality which is also case company priority.

The issue that came up the most in the interviews was there is not any official contact person list maintained by the case company. The interviewees raised this issue up even though they did not consider it to be significant because they all were aware of current contact persons. There could be some unofficial contact list but mainly contact are made based on previous contacts found from emails. At the moment, personnel changes are communicated by email. It would be good to have automatically updated contact person list which can be shared to suppliers. Case company has experience with similar lists in excel format but in those cases at some point list have been left un updated. So, it has been said that the list should work in a way that information is retrieved from the organization charts in the SharePoint system. Also, up-to-date list of suppliers contact persons should be maintained to selected group of case company people to view.

Although, both supplier and case company side have lately had growth in some extend to quality resources it still isn't too much. Among the suppliers and personnel of case company quality and purchasing department the ways of cooperating have formed with the constrains of resources in recent years. There is no model for how to co-operate in different situations. Many times, persons in different positions are handling questions for behalf of other positions to proceed as quickly as possible. Also, supplier quality development cooperation between parties have been at the minimum for a long time. There should be a road map or instructions to these co-operating situations, some kind of agreement on how to operate. Personnel should be aware in which situations contact to other department and when handle issues solo. People need to be aware in which meetings other departments representative should be present and when to take contact for example to design department. Smooth cooperation between case company departments clarifies supplier cooperation and helps building trust to that direction.

### **5.3 Suggestions for further research**

Many great studies were used as a resource in this research and there are even more interesting studies from the field of quality. In general level these studies pretty much cover all important areas of quality. But for the specific requirements of this study's case company there are definitely room for further research. Because of semi structured nature of questions in interviews the answers were extensive and diverse. So, many small things emerged that could be explored further, not alone but as part of a larger sampling. In addition to this, some larger entities which can be researched in future emerged.

Of course, a small number of suppliers included in this study arouses interest in the results that would be obtained from a study conducted on a larger group with lesser-known suppliers. Also, similar study implemented for foreign country suppliers would be welcome.

Case company purchasing department conduct annual surveys to suppliers from the purchase point of view. It would be great to have similar annual survey completely in terms of quality. The most relevant questions could be clarified to monitor annual trends in quality cooperation.

Also, would be interesting to explore quality cooperation inside the case company. Between the case company departments, but especially cooperation with case company foreign units and foreign quality departments which are doing work for the benefit of the case company.

## 6 Conclusion

The aim of this research was to investigate the quality cooperation between case company and four nearby suppliers. There have been some differences of opinion on the state of quality cooperation. Not so much direct disagreements but for various reasons such as ambiguities in communication. The willingness of suppliers to improve the quality cooperation created a good starting point for research. Interviews implemented to suppliers were the most important part of the data collection in this study and the foundation to questionnaire and research was the reviewed quality literature. The findings were compared to some previous research in literature.

Research questions were set in a way which can provide answers to issues raised on scanning of the topic of research and to give material for future research.

The first research question was set as: *What is the current status of quality perspective differences between case company and suppliers.*

Supplier and case company views on quality were examined for example by making questions on quality status widely in word, between the different components and more specific between the case company and supplier. And furthermore, specific questions like status of communication between case company and supplier. The interviews showed quality challenge areas to be same from both parties' point of view, just a viewing perspective makes opinions a little different. These views are explained in detail at discussion chapter and this chapter shows situation in wider perspective.

First, it is good to get an insight into the participants' thoughts on the quality situation in general. To understand whether the premise is positive or negative. Both parties, suppliers and case company feel quality situation in the industry has slightly improved. And the company's supply chains have developed in a direction where there is no longer any clear difference about quality between component delivery countries or between components. Foreign suppliers have shown fast learning curve in quality matters. Also, the



quality resource situation has slightly improved in both parties. The question is more in how resources are used and allocated and still much of the time goes to putting out 'fires' to keep up with daily operations.

As seen today in general, for example in online discussions, communication has gone in an unfriendly and tougher direction. This same phenomenon has also been noticed in quality communication. Although, among participants of this research this is not the case. Good personal relationships have been praised. In the discussion chapter 5. issues causing differences were gone thru in more detailed, but it seems the most significant issue is communication in its many forms. Tough, the personal relationships are at a good level the communication can be sometimes confusing. Not just into who to phone or email but also and even more the data and information shared and send in various formats. For example, how to provide and were to find documents or how to keep up with document revision changes. Only a small number of people know how to act. Also, same issues have been seen in some extend in inside communication of case company. One good example of different views of same issue is the contacting in case of problems. Usually supplier side wants to take contact to case company purchasing personnel because that is what they feel is most comfortable. While, case company side feels the direct contact to quality personal in quality matters would be the best way. So, this issue comes down to the communication, the habits on how to communicate and communication on how case company wants to carry out communication.

The second research question was set as: *How to get cooperation working smoothly and effectively between company and small Finnish suppliers.*

Answers to questions in the questionnaire revealed many things to change or to do better. Most of the issues which come up were somewhat minor but formed entities with other answers under some bigger issue. In the findings chapter all the issues raised up from questionnaire were dealt. There are many things to investigate and study in the future. Those things were shortly gone thru in conclusion chapter. But for this study the

most interesting and significant issues to make cooperation better are presented in this chapter.

First actual thing that popped up from interviews was the lack of any real list of persons to contact in quality as well as in other matters between supplier and case company. Though, current situation with who to take contact is clear there is worry how things are in case of personal changes in both parties. So, up to date contact person list would be good. And the tool for keeping the list up to date, not just excel but some kind of automation for this because excels have been noticed to be left behind. Maintenance is always behind some individual.

Another thing that shines through the many responses is the trust. Of course, the improving of trust is subject of many researches but for this study something real is wanted to be develop right away. Also, human errors were identified to cause quality issues often. For improve both issues yearly meetings in person between case company quality personnel and suppliers are proposed. Such semi-official meetings would be good to get individuals to know each other more and that way increase trust between parties. Furthermore, in these get to gathers the case company customer applications and quality issues effecting to those could be presented. Making supplier personal aware of end user equipment's and problems would most likely make them more committed to quality and possible that way reduce human errors.

Furthermore, questionnaire revealed the situation with instructions and practices to be somewhat confusing. At the moment, there are slightly different ways of working with each supplier. Cooperating is up and running but there is feeling that it has formed on its own and is somehow fragile. It is known case company has comprehensive collection of instructions and other documents in databases but the knowledge and ways of providing those to subcontractors varies a lot inside the case company. At least, in case of new suppliers, starting package or instructions of what to require and provide to supplier would be good for both parties. Of course, individual employees have their own ways of

working, but it would be good for example, in case of new employees to have instructions, especially from the point of view of quality. The up most would be the globally united package of cooperating instructions and bringing up awareness of their existence and operation.

Altogether, this area of research was found to be interesting and much remains to be done for future studies. Though, there are issues to improve in quality cooperation, current situation can be approached with peaceful mind. There is nothing catastrophic behind the corner. In some extend the huge size of multinational company reflects problems at the local level. Sometimes there is feeling 'right hand doesn't know what left hand is doing' and many problems could be already solved without knowing it in other regions.

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## Appendices

### Appendix 1. Alihankkijatutkimus: Haastattelukysymykset toimittajat

*Alihankkijatutkimus: Haastattelukysymykset toimittajat*

1. *Laatu tilanne yleisesti:*

- a) *Laatu tilanne kaikki asiakkaat/ kohde yritys?*
- b) *Kehityssuunta eri asiakkaiden välillä ja eri komponenttien välillä? Nostaako joku alue päätään?*
- c) *kohde yrityksen eri osastojen kanssa toiminta...mitä eri osastoja ja paljonko yhteistyötä, onko eroja?*
- d) *Auditointi tilanne/ mitä mieltä niistä? Onko usein kohde yritys/muut asiakkaat? Onko apua/haittaa? Onko kehitystä saavutettu niiden johdosta?*
- e) *Onko laatu henkilöt tiedossa, listattu, koulutus? Entä kohde yrityksessä, onko tiedossa vastuut/henkilöt?*
- f) *Mistä tuntuu laatu ongelmat johtuvan, ohjeet, huolellisuus, kommunikointi, ali-toimittajat, logistiikka, ym?*
- g) *Onko raporttien/mittauspöytäkirjojen tuottaminen selkeää, mihin lähetetään/tal-letetaan, mihin järjestelmiin?*

2. *Materiaaton laatu:*

- a) *Kuinka on saatavilla dataa/tietoa? Entä piirustukset revisioita? vaatimusten selkeys?*
- b) *Toimitus ajat/vaatimukset, onko realistiset?*
- c) *Reklamaatioiden tilanne? Vastausajoissa pysyminen ja yhteistyö?, Oppi reklamaatioista, miten menee viesti työntekijöille? järjestelmien/postin käyttö? Reklamointi omille toimittajille/ali-toimittajat? Eli yhteistyö reklamaatioiden jalkauttamisessa/koulutus apu?*
- d) *Onko Aftersales yhteistyötä kohdeyrityksen ja sen asiakkaiden kanssa? kuinka huomioidaan komponenttien ja niiden valmistuksen jäljitettävyys?*
- e) *Mitä järjestelmiä käytössä kode yrityksessä/muilla? Aiheuttaako järjestelmien käyttö hankaluuksia?. SAPIin pääsy/käyttö?*

3. *Laatu yhteistyö:*

a) *Kuinka laadusta kommunikoidaan? Järjestelmät, posti, nopeus/vastaukset, tiedon tarkkuus?*

*käydäänkö kohde yrityksen kanssa läpi laatu asioita/kuinka usein ym.?*

b) *Vaikutuskeinot ja mahdollisuudet laatuun kohde yritys yhteistyössä? (hierarkia -> mahdollisuudet, uskallus)*

*Kuinka uskaltaa kehitys ehdotuksia tuoda esille? onko kommunikoinnin kohde tiedossa kohde yrityksessä?*

*Proto sample yhteistyön toimivuus suunnittelun ym kanssa?*

c) *Onko tietojen sijainti henkilöiden takana? Onko tallessa vai "päässä", tiedot toimintoista, henkilöistä, proseduureista?*

d) *Miten järjestelmien käyttö? Sharepoint, SAP, Piirustukset. (revisiot ym.)? Onko selvää mihin tahoihin ollaan yhteyksissä kulloinkin?*

4. *Laatu kehityskohteet:*

a) *Missä voisi olla eniten kehitettävää?*

b) *Onko kehitys kohteita kohde yrityksen eri osastojen välillä?*

c) *Minkä asian ympärillä käytetään eniten aikaa nykyään.*

d) *Mikä toimii yhteistyössä ja laadun saralla hyvin? Onko löydetty tapoja jotka voisi ottaa laajemminkin käyttöön?*

e) *Mitkä olis esim top 3 asiaa jotka olis hyvä laittaa kuntoon (kiteytys)?*

1.B *Laatu tilanne alihankkijoilla: kysymykset vain kohdeyrityksen edustajille.*

a) *Mikä on suuntaus tällä hetkellä, nostaako joku osa alue päätään.*

b) *Onko mittareita meillä/toimittajilla, ja minkä laisia?*

c) *Mistä tuntuu laadun ongelmat johtuvan. Esim. ohjeet, huolellisuus, kommunikointi, ali-toimittajat, logistiikka... ratkaisua ei tarvi pohtia nyt.*

d) *Miltä näyttää auditointien näkökulmasta? hyödyt? onko kehitystä saavutettu niiden johdosta?*

- e) *Onko tietoa mistä löytyy mittapöytäkirjoja ja miten ohjeet menee toimittajille?*
- f) *Onko eroja materiaali ryhmittäin/ komponenteittain?*

## Appendix 2. Summary of interviews

section	Summary of interviews: Suppliers	Summary of interviews: case company
<p>Quality status in general</p> <p>-Supplier quality status:</p> <p>-Trend in different components:</p> <p>-Quality resource situation</p>	<p>-Quality stayd apr: at the same level for years now. Opinions to both directions.</p> <p>-Finland or any other country have not been mentioned for the better quality. Other countries provides also good quality</p> <p>-Documentation increased, which increases quality but also workload.</p> <p>-Some variation in quality between subcontractors, visual quality slightly upraced.</p> <p>-Two suppliers have a separate quality manager, for the others, managers are responsible for quality.</p> <p>-It has been mentioned about communication that it has gone in a slightly more unfriendly direction, including differences of opinion about quality.</p>	<p>-Supplier quality situation is better than some years ago. Learned to develop new suppliers effectively.</p> <p>-There are no clear differences in deliveries due to the source country.</p> <p>-Product transfers have come with suppliers with different operating methods.</p> <p>-Sometimes the line between own quality and supplier quality is blurred.</p> <p>-Also, in the component level, quality have improved throughout suppliers.</p> <p>-In some components, it feels like some quality cases lead to own actions. Readiness of new designs could be better.</p> <p>-In own company the quality resource situation has somewhat improved, but focus could be more on supplier in quality. Supplier quality responsibility should be extended wider in own organization.</p> <p>-In higher organizational level the development is not what it could be. Use of a global quality organization is tricky.</p>



Supplier quality	<ul style="list-style-type: none"> <li>-The origin of quality problems clarified in order, carefulness, communication and instructions.</li> <li>-Some problems with sub-subcontractors and external warehousing caused mainly by negligence (e.g., shipments incorrect). However, only a few carry out the actual reclamation.</li> <li>-The drawing browser works great but with revisions there are challenges. (Several sub-images needs some kind of alert)</li> <li>-Also, unclearness with instructions updates.</li> <li>-Audits useful, have been able to improve own operations.</li> <li>-The fairness of audits vis-à-vis foreign countries is somewhat questionable.</li> <li>-Efforts have been made to document e.g. drawing reading- and machine-specific instructions. However, a lot of information is still out of people heads.</li> <li>-Complaints are experienced as constructive and preventive.</li> <li>-Information is passed on to departments through managers and quality personnel, also info screens in use.</li> <li>-The origin of the cause of the complaints is usually traceable.</li> <li>-The saving of documents and measurement reports / material markings seems to be clear.</li> <li>-There are differences in data storage preferences between different customer units.</li> <li>-The use of Share point for sending documents varies, and e-mail is still used.</li> <li>-ASCC order tool in use, although problems. Help received for this.</li> <li>-In general, delivery times are reached.</li> <li>-After sales cooperation was hardly identified, but opportunities for cooperation were seen.</li> </ul>	<ul style="list-style-type: none"> <li>-is company able to communicate the requirements correctly to the supplier. Some alert system for revision changes in drawings would be good.</li> <li>-Is the communication reliable enough for a non-physical product. For example, material certificates.</li> <li>-Suppliers are positive about the audits, the desire to meet the requirements of the audits is there. But will the changes go to the end.</li> <li>-Should more actively monitor the findings of audits.</li> <li>-Inspection documents should go to supplier portal in Share point, instructions to IWS and drawings with WEB portal.</li> <li>-Feeling is that the readability of the instructions from IWS is not as good as it should be. Are company own people aware of how the documents should go to the supplier.</li> <li>-There are operational differences between company units from systems to packaging.</li> <li>-The required data is obtained from suppliers and it is accurate, however this is poorly controlled.</li> <li>-After sales cooperation is really marginaly, there could certainly be more. Problems are often difficult to target, but there seems to be a willingness to cooperate.</li> <li>-The general culture among suppliers is that things are done properly.</li> <li>-Negligence problems comes up from time to time. Way, does not get the humanity aspect removed permanently.</li> <li>-Some suppliers have a high level of reclamations, but on the other hand, inspections are also carried out significantly more for some suppliers.</li> <li>-The inefficiency of the quality of some processes has to be remedied by 100% inspections, on the other hand do company need 100% inspections while supplier is also making 100% inspections.</li> <li>-There are OTD and PPM metrics to measure supplier performance, but are the supplier and company metric compared to each other.</li> <li>-There are some components, such ones made from aluminum, for which there is no precise information on how the supplier should measure them, and own inspection dep. may not measure those at all.</li> <li>-Possible more automotive-style requirements that may come from the higher level in the future makes wonder on how will suppliers manage this change?</li> </ul>
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<p><b>Quality co-operation</b></p>	<p>- In daily communication, phone, email and Whatsup in use.</p>	<p>- The purchase has seasonal meetings with a quality section included. It might be good to have a quality person involved, it would allow a better collaboration.</p>
<p>-Communication</p>	<p>-Purchasing seasonal meetings have a quality section that seems to be enough in general level.</p>	<p>-Communication by e-mail and telephone. No document is left on the calls.</p>
<p>-Means of influence</p>	<p>-Good relationships makes co-operation easy, even in problematic situations.</p>	<p>-In many cases, the first connection is to purchase, sometimes things could be left not confirmed from the design department.</p>
<p>-Reachability</p>	<p>-Suppliers have the feeling that they are in the same boat, daring to bring forward development proposals and difficult issues. "If there is a stone in the shoe it has to be taken away, otherwise you have to limp for the rest of your life".</p>	<p>-It seems like there is sometimes a difference of opinion between "me" and company</p>
	<p>-There is development cooperation with design department. Cooperation is fast in quality matters.</p>	<p>-Those in different positions have their own contact networks, the supplier notifies of the changes by e-mail. Even in own company, sometimes contacts are a bit missing.</p>
	<p>-On the other hand, at the general level, more cooperation is desired.</p>	<p>-Some use shared mail in addition to personal mail.</p>
	<p>-The right contacts can be found on the basis of earlier communication. Most communication with purchase department.</p>	<p>-There should be a contact system that is not person bound. An excel of persons is hard to maintain, should have some tool for this.</p>
	<p>-Sometimes there have been notifications when there have been person changes in the client's organization, but some sort of up-to-date contact list should be good.</p>	
	<p>-Some suppliers use shared mail.</p>	
	<p>-Communication with Estonian purchase is more difficult. Ambiguities are difficult to resolve.</p>	
	<p>-It has been noticed that the customer's lack of resources sometimes complicates / slows down communication and cooperation.</p>	

<p><b>Quality improvement</b></p> <ul style="list-style-type: none"> <li>-Development items</li> <li>-Monitoring now</li> <li>-Good practices</li> <li>-Top 3 improvement.</li> </ul>	<ul style="list-style-type: none"> <li>-Cooperation could be improved by clarifying communication. Differences between customer departments and buildings. A comprehensive, up-to-date contact list would be good here. Bureaucracy complicates and delays things.</li> <li>-Customer-supplied component quality should be more consistent, also from the packaging point of view.</li> <li>-The control of customer-specified sub-suppliers should be clear, Who, how and according to whose instructions are used in control.</li> <li>-The small size of the storage buffers is questionable. Can't really afford any waste.</li> <li>-Revision changes to drawings needs to be clearer. Some kind of alarm to revision changes would be good.</li> <li>-Better access to the instruction data base. Faster information about changes.</li> <li>-More co-operation is hoped for in terms of efficiency and savings.</li> <li>-With quality department, even more proactive action would be welcome.</li> <li>-Meetings with quality people are hoped for, for example, once a year.</li> <li>-It would be good to make MSP more stable and to make Share Point more efficient.</li> <li>-The elimination of human error must be intensified and the carefines errors must be reduced.</li> <li>-In general, cooperation is good and genuine thanks to good personal relationships.</li> <li>-Component deliveries from the customer have been brought into balance.</li> <li>-Drawing retrieval practice is good. In other customer units it requires permission.</li> <li>-Purchases proactive actions with new parts is a good thing.</li> <li>-On the quality side, proactive action has also been found to be good. Improvements have been obtained.</li> <li>-Documentation on certain issues is good. Good if you need to figure something out afterwards.</li> </ul>	<ul style="list-style-type: none"> <li>-A quality culture must be developed in the direction of the supplier. There must be information sharing on engine applications and the impact of errors to the end user. Also security and economy perspective must be included.</li> <li>-The quality department should be able to practice more development in supplier quality matters. Also in cooperation with procurement.</li> <li>-There should be quality assurance plans for the supplier for each component and better documenting which components are traceabil and which are not.</li> <li>-What is required of the supplier should be sharpened and clarified and everyone should be aware of this.</li> <li>-Component packing responsibilities should be clearer.</li> <li>-It feels like time goes out to put out "fires" and you can't invest in improving your operating culture and processes.</li> <li>-With new suppliers, lessons have been learned to work effectively</li> <li>-The requirements of company units need to be harmonized with each other. Orders for Ford parts can come from 4 different countries in the future.</li> <li>-The company needs to put a decent investment in supplier cooperation. quality expertise needed to support procurement.</li> <li>-Making of reclamations should be sharpened. In production, sometimes no reclamation is made, only the problem is repaired.</li> </ul>
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